United States Department of Agriculture

Economic Research Service

Economic Information Bulletin Number 215

January 2020

The Fate of Land in Expiring Conservation Reserve Program Contracts, 2013-16

Daniel Bigelow, Roger Claassen, Daniel Hellerstein, Vince Breneman, Ryan Williams, Chengxia You

United States Department of Agriculture

Economic Research Service
www.ers.usda.gov

Recommended citation format for this publication:

Daniel Bigelow, Roger Claassen, Daniel Hellerstein, Vince Breneman, Ryan Williams, Chengxia You. 2020. *The Fate of Land in Expiring Conservation Reserve Program Contracts, 2013-16* EIB-215, U.S. Department of Agriculture, Economic Research Service.

Cover is a derivative of images from Getty Images.

Use of commercial and trade names does not imply approval or constitute endorsement by USDA.

To ensure the quality of its research reports and satisfy governmentwide standards, ERS requires that all research reports with substantively new material be reviewed by qualified technical research peers. This technical peer review process, coordinated by ERS' Peer Review Coordinating Council, allows experts who possess the technical background, perspective, and expertise to provide an objective and meaningful assessment of the output's substantive content and clarity of communication during the publication's review.

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at How to File a Program Discrimination Complaint and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.

United States Department of Agriculture

Economic Research Service

Economic Information Bulletin Number 215

January 2020

The Fate of Land in Expiring Conservation Reserve Program Contracts, 2013-16

Daniel Bigelow, Roger Claassen, Daniel Hellerstein, Vince Breneman, Ryan Williams, Chengxia You

Abstract

Voluntary retirement of cropland under the USDA's Conservation Reserve Program (CRP) provides numerous benefits related to soil erosion, water quality, wildlife habitat provision, and other environmental services. The persistence of benefits realized under the program depends on what happens to CRP land when the contract expires. Using a novel dataset of expiring CRP contracts and post-CRP land use over 2013-16, this report considers the fate of the 8.1 million acres of land in active CRP contracts in 2012—roughly one quarter of all CRP land—that expired between 2013 and 2016. This period partly coincided with relatively high crop prices and relatively low reenrollment opportunity. Most land (64 percent) did not reenroll in the program, and about 80 percent of non-reenrolled land converted to some type of crop production over the subsequent 1-4 years. The land in expiring CRP contracts is geographically dispersed, with higher reenrollment rates for land in "continuous" CRP signup—a CRP segment that targets practices and land with high conservation value—and for land contracted for a tree-cover practice. Conversion of CRP land to crop production tends to be concentrated in the Corn Belt and on exiting continuous CRP land.

Acknowledgments

The authors would like to thank Steve Wallander, Kelly Maguire, and Jeff Hopkins, USDA, Economic Research Service (ERS), and Cathy Feather, Richard Iovanna, and Alex Barbarika USDA, Farm Production and Conservation (FPAC). They also thank two reviewers who requested anonymity. Thanks also to Maria Williams and Andrea Pimm, USDA, ERS.

Keywords

Conservation Reserve Program, Common land units, Cropland Data Layer, CRP contracts, expiring CRP, fate of CRP land, CRP land use

Contents

Summary iii

Introduction 1

What Is the Conservation Reserve Program and What Are the Recent and Historical Trends in CRP Enrollment? 4

CRP Reenrollment 9

Temporal Trends 9

General Versus Continuous Signup Reenrollment 10

Regional Trends/Geographic Patterns in Reenrollment 13

Practice-Specific Trends in Reenrollment 16

Post-CRP Land Use for Land That Exits the Program 19

Temporal Trends in Post-CRP Land Use 19

General Versus Continuous Signup Trends in Post-CRP Land Use 21

Regional Trends/Geographic Patterns in Post-CRP Land Use 22

Practice-Specific Trends in Post-CRP Land Use 24

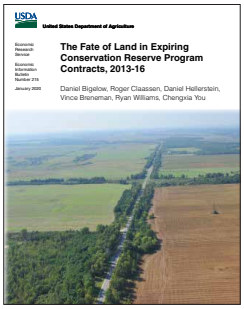
Conclusions and Policy Implications 26

References 29

Appendix 31

United States Department of Agriculture

A report summary from the Economic Research Service *January 2020*



The Fate of Land in Expiring Conservation Reserve Program Contracts, 2013-16

Daniel Bigelow, Roger Claassen, Daniel Hellerstein, Vince Breneman, Ryan Williams, Chengxia You

What Is the Issue?

The Conservation Reserve Program (CRP), administered by the USDA's Farm Service Agency, is the largest land-retirement program in the United States. Under the CRP, landowners voluntarily retire environmentally sensitive cropland for 10-15 years in exchange for an annual rental payment. Once a CRP contract expires, land may be reenrolled, subject to the availability of signup opportunities. Since 2008, the acreage enrollment cap allotted to the program has been decreasing, reducing opportunities for reenrollment and resulting in almost 13 million acres exiting the program. What happens to the land that exits the CRP has policy implications from both a program budget and environmental stewardship standpoint. For example, if exiting land tends to remain in grass or tree cover, even in the absence of program payments, conservation benefits will likely persist beyond the duration of the contract. This report analyzes the rate at which CRP lands have recently been reenrolled and, further, how land is used after it exits the program.

What Did the Study Find?

Of the 8.1 million acres enrolled in CRP contracts that expired during 2013-16, 7.6 million are tracked in this report. Overall, 36 percent of expiring CRP land was subsequently reenrolled:

- For land enrolled through the "continuous" CRP sign-up—a CRP segment targeting practices and land with a high conservation value—48 percent was reenrolled versus 34 percent for land enrolled through the "general" sign-up—the mechanism by which a majority of CRP land is enrolled.
- Land originally enrolled under a tree-cover practice was the most likely to be reenrolled (47 percent reenrolled between 2013 and 2016), compared to land enrolled under grass (35 percent), wetland (39 percent), or wildlife habitat practices (29 percent).

ERS is a primary source of economic research and analysis from the U.S. Department of Agriculture, providing timely information on economic and policy issues related to agriculture, food, the environment, and rural America.

- While in most States, less than half of the expired CRP land was subsequently reenrolled in the program, there were notable exceptions, including Mississippi (67 percent), Iowa (52 percent), and Idaho (51 percent).

Fifty-one percent of expiring CRP land was put into some type of crop production including annual crops (36 percent), perennial specialty crops (7 percent), and perennial forage crops (7 percent):

- On land that transitioned to annual crop production, the most common crops were soybeans (21 percent), corn (16 percent), and wheat (16 percent).
- Post-CRP annual crop production was particularly high in many Midwestern and neighboring States, with 70 percent or more of exiting land in annual crops in Ohio (75 percent), Kentucky (74 percent), Michigan (72 percent), Iowa (71 percent), Minnesota (70 percent), and Missouri (70 percent).
- Exiting CRP acres that had been in a CRP wetland practice had the largest share of post-CRP annual crop production (65 percent). Land in tree-cover practices had the lowest share in annual crops (13 percent).
- In contrast, exiting general sign-up land was nearly twice as likely as exiting continuous land to be put to grass or forage crop use.

About 13 percent of expiring CRP land was in grass cover (9 percent), tree cover (4 percent), non-CRP conservation programs and other uses (<1 percent each). In many cases, grass and tree cover likely represents a continuation of the CRP cover, although these lands could be used in ways that would not have been allowed under CRP contract (e.g., annual grazing).

- Tree cover was far more likely to be present on exiting CRP land formerly enrolled for tree-related practices, compared to other types of expiring CRP land, and was most common in Georgia (92 percent of land exiting CRP) and Mississippi (63 percent).

How Was the Study Conducted?

This report primarily relies on crop reporting historical data from the USDA Farm Service Agency's Modernize and Innovate the Delivery of Agricultural Systems (MIDAS) database. The unit of analysis for the study is the Common Land Unit (CLU), defined by USDA's Farm Service Agency (FSA) as the "smallest unit of land that has a permanent, contiguous boundary, a common land cover and land management, a common owner and a common producer in agricultural land associated with USDA farm programs." We supplement the MIDAS data with information from the USDA National Agricultural Statistics Service's Cropland Data Layer when the CLU associated with the expiring CRP contract is missing from the MIDAS data. This allows us to account for 94 percent of land in expiring CRP contracts over the study period. We also draw on CRP contract administrative data to provide context for possible biases in the MIDAS database. National Resources Inventory (NRI) data provide background information on land use transitions into and out of CRP for years preceding the study period (1996-2012). In addition, FSA's historical records of program descriptions and publicly available data on current CRP patterns are used to supplement and provide context for the main analysis.

The Fate of Land in Expiring Conservation Reserve Program Contracts, 2013-16

Introduction

With a July 2019 budget over $1.8 billion and an enrollment of over 22.3 million acres, the Conservation Reserve Program (CRP) is by far the largest agricultural land-retirement program in the United States. In exchange for an annual rental payment, the CRP incentivizes farmers to set aside environmentally sensitive cropland for a contract period lasting 10-15 years. CRP participation is voluntary, with much of the enrolled acreage accepted into the program through a general signup characterized by a competitive reverse auction mechanism. When contracts expire, participating landowners are faced with the decision of whether to attempt to reenroll their land in the program, if that option is available, or convert it back to crop production or another use.

This report inquires about what happens to the land that was formerly enrolled in CRP when its contract expires. Is it likely to be reenrolled in the CRP for another contract period? If not, is the exiting land put back into crop production or is it retained in a non-crop cover without CRP rental payments? Do these patterns vary by geography, CRP signup type, or the contracted conservation practice previously in place on the land? These questions concerning the "fate" of expired CRP land have implications for the environmental effects of agricultural land retirement policy and fiscal appropriations for the Conservation Reserve Program under the conservation title of the farm bill.

CRP reenrollment and post-contract land use decisions affect the environmental benefits brought about by the program. If crop production takes place on lands formerly enrolled in the program, there will be a concomitant discontinuation of certain types of benefits. For example, if land is enrolled in the program to provide a streamside riparian buffer, many of the water quality enhancements achieved over the contract period are unlikely to persist into the future. Exiting the CRP, however, does not erode many of the benefits that had been achieved up to that point.

Furthermore, when considering effects of CRP enrollment, it is important to distinguish between public and private benefits. The public benefits of CRP participation include increased water quality and other enhancements to ecosystem services (e.g., wildlife habitat provision, erosion control, and carbon sequestration). These benefits accrue to some segment of the general public that is external to the process that led a particular piece of land to be enrolled in the program. In contrast, the private benefits of CRP enrollment are the payments given to farmers for putting their land in the program, as well as any private enjoyment they may get from the ecosystem services flowing from the retired parcel and possible gains in future productivity from fallowing the land.

Although CRP payments at the time of enrollment may have been sufficient to make enrolling privately optimal, market and production conditions change, and at the time of expiration, it may no longer make sense for the landowner to participate in the program. In addition, when one plot of land exits the program, it may be accompanied by enrollment of another that may provide more, or less, benefit to the public. Although it is clear that determining the net benefits of CRP reenrollment and exit is complicated, information on trends and patterns of reenrollment and post-CRP land use is a first-order requirement for an informed analysis of this issue.

In analyzing the fate of expiring CRP land for contracts ending between 2013 and 2016, this report provides timely information on CRP reenrollment patterns and the short-term durability of program-induced land retirement. Prior efforts to study the fate of expired CRP land have yielded mixed results. In a study of the first cohort of CRP land, enrolled in the mid-1980s with contracts expiring during 1995-97, Roberts and Lubowski (2007) find that 63 percent of expired CRP land that exited the program was converted to crop production, with lower rates of crop conversion for CRP land that had been enrolled under a tree- or wildlife-cover practice. Using a statistical model to account for the nonrandom composition of CRP lands with expiring contracts, they further show that 58 percent of CRP land would likely have converted back to crop production immediately if the program were terminated. Similarly, Hellerstein and Malcolm (2011) develop an "opt-out" model showing that roughly 30 percent of CRP land in 2010 would leave the program and return to crop production if given the opportunity under prevailing commodity prices. Jones et al. (2013), studying a longer time period, show that the high rate of crop conversion prevalent among early CRP exits did not persist, with roughly 84 percent of land in contracts expiring between 1998 and 2007 never returning to crop production (including reenrollment). Jacobson (2014), however, provides evidence suggesting that the soil health improvements brought about by the CRP increase the land's productive potential and stimulate a greater likelihood that it will return to crop production, compared with other non-CRP cropland that was voluntarily removed from production over the same time period. More recent research in the Midwest shows that CRP land expiring over 2009-12 was reenrolled at a rate of 41 percent, with roughly 30 percent of all exiting land going into one of five major crops (corn, soybeans, winter wheat, spring wheat, and sorghum) (Morefield et al., 2016).

A common thread in the existing literature is that CRP cropland conversion is positively correlated with commodity prices. For instance, the low rate of conversion observed in Jones et al. (2013) is likely driven by the fact that 1998-2007 was a period of relatively low crop prices. In contrast, Morefield et al. (2016), who find a relatively high rate of post-CRP cropland conversion, consider 2009-12, a period when corn prices reached a record high (in 2012). For context, the present study focuses on CRP reenrollment and post-CRP land use patterns for contracts expiring over 2013-16, a period characterized by high commodity prices, though not as high as those encountered in Morefield et al. (2016).[1] The 4-year period covered by this study (2013-16) was also notable for its lack of reenrollment opportunities for a large portion of the land associated with expiring contracts. Most land in the program is enrolled through the general signup, which has historically taken place on a roughly annual basis. However, over 2013-16 just two general signups were held, one in 2013 and another in 2015-16, with the latter being quite small by historical standards based on the amount of land that was accepted into the program.

It bears mentioning that, while post-CRP land use decisions are influenced by crop prices, the policy itself can, in turn, affect market conditions. Hendricks and Er (2018) note how the CRP also acts to support commodity prices, with CRP acreage enrollment caps expanding during times of low prices and contracting during times of high prices. Their results indicate that 60 percent of CRP land expiring between 2007 and 2011 reverted to crop production, a shift large enough to explain cropland changes typically attributed directly to biofuel policy.[2] In other words, Hendricks and Er (2018) posit that it was not the biofuel policy itself that led to an expansion of cropland acreage, but rather

[1]As an example, according to data from USDA's National Agricultural Statistics Service, the real annual average price (in 2018 $USD per bushel) of corn, one of the most common post-CRP crop choices, was $2.96 over 1998-2007, $5.70 over 2009-12, and $3.83 over 2014-17.

[2]Roberts and Lubowski (2007), Jones et al. (2013), and Hendricks and Er (2018) all rely on data from the National Resources Inventory, which classifies land as CRP only if it is enrolled through a general signup.

that biofuel policy increased crop prices, which in turn led to a release of land from the CRP that was subsequently converted back to crop production.

The goal of this report is to provide updated information on the fate of expiring CRP land. To accomplish this, we analyze contract-level data on expiring CRP acreage over 2013-16 matched with data on reenrollment. In addition, we analyze the post-CRP land use for the land that exited the program (i.e., was not reenrolled). Our analysis considers variation in CRP reenrollment and post-contract land use across the United States, different CRP signups (general versus continuous), and classes of CRP conservation practices (tree, grass, wildlife, and wetland). The findings documented here provide the most comprehensive look at the fate of expiring CRP acres over 2013-16 and are meant to inform policy discussions concerning the persistence of CRP-induced land use change.

What Is the Conservation Reserve Program and What Are the Recent and Historical Trends in CRP Enrollment?

The Conservation Reserve Program (CRP) is a voluntary land retirement program that offers annual rental payments to farmers in exchange for retiring environmentally sensitive farmland, typically cropland. Established in 1985 as part of the Food Security Act, the CRP is the largest program of its kind in the United States. CRP contracts, a majority of which are allocated through intermittent reverse auctions managed by USDA, Farm Service Agency (FSA), last 10-15 years.[3] In these general signup periods, owners of eligible cropland may submit an offer, which contains a bid corresponding to the annual rental payment the landowners would accept to install a specific conservation practice. The manner in which land is enrolled in the CRP and the criteria for ranking bids have evolved over time (Hellerstein, 2017). Currently, land is ranked on the basis of cost effectiveness and a suite of environmental criteria including erosion control, water quality enhancement, and wildlife habitat provision. As described in the box titled "The CRP's Enrollment Mechanisms," in addition to land enrolled through the general signup, land may also be enrolled through a continuous signup restricted to lands suitable for one of several targeted CRP initiatives or specific high-priority practices (such as Pollinator Habitat and Wetland Restoration). In contrast to the general signup, if a parcel is eligible for continuous CRP and the owner wishes to enroll the land for the pre-specified rental payment established by FSA, it is automatically accepted into the program.

CRP acreage enrollment has fluctuated over the years, peaking at 36.7 million acres in 2007 (figure 1). As of February 2019, the program enrolled 22.4 million acres, its lowest level since 1988 when the program was still being phased in. Apart from 1997, when the initial set of CRP contracts expired, expiration peaked at 6.5 million acres in 2012. In general, the pattern of expiration lags enrollment. After enrollment hit its peak in 2007, program acreage has since declined steadily. Likewise, since 2012, the quantity of expiring acres has not been matched by enrollments. As a 4-year moving average, the expiring acreage observed over 2013-16 (2.02 million acres) is slightly below the median over the entire 1998-2016 period (2.19 million acres). The period considered in this analysis is therefore relatively normal in terms of how much land has been subject to an expiring contract over the program's history.

The amount of land able to be placed in the CRP is bound by annual enrollment caps set at each iteration of the farm bill. The enrollment cap affects the fate of expiring CRP land because it determines the amount of land that can be accepted into the program, including expiring land that may be re-offered. As noted by Hendricks and Er (2018), enrollment caps reflect commodity market conditions in the period surrounding farm bill negotiations. For example, in the years preceding negotiation of the Food, Conservation, and Energy Act of 2008, prices of corn and other commodities spiked due to the increased use of commodities for biofuels, among other factors (Trostle et al., 2011). The enrollment cap was reduced over 2008-2013 in the bill (figure 1), leading to a subsequent reduction in total enrollment.

By the same token, the Farm Service Agency did not hold a general CRP signup from 2007 to 2009, which likewise contributed to the release of some land from the program. However, to smooth the

[3]In most circumstances, if a CRP contract is broken prior to the contract expiration date, all payments received must be paid back with interest. Likewise, if CRP land is sold, the buyer to the contract has the choice to remain, in whole or in part, or not to remain into the program. If the buyer chooses not to remain, then the seller is responsible for repaying all incentive payments plus liquidated damages. In essence, the financial burden falls on the seller if the new owner of the land no longer wishes to participate in the CRP.

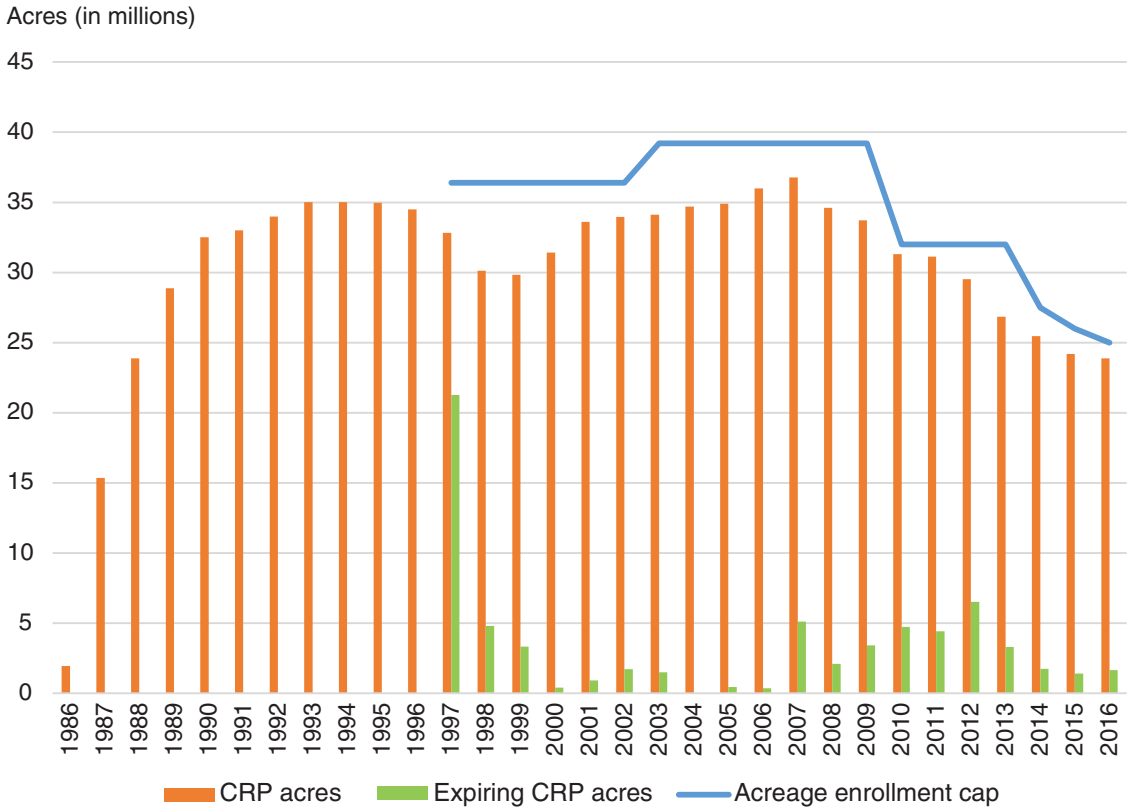
expiration of the 16 million acres originally set to expire in 2007, FSA implemented the reenrollment and extension (REX) initiative in 2006. The REX initiative allowed contract reenrollments or 2-5 year extensions of CRP contracts set to expire over 2007-10, with the extension length depending on the Environmental Benefits Index (EBI) score of the enrolled land.[4] Participants took advantage of the REX opportunity for over 80 percent of expiring CRP acreage (Hellerstein, 2017). Similarly, in the lead-up to the Agricultural Act of 2014 (2014-2018), prices spiked (again due to a variety of factors, including macroeconomic trends and sustained increases in biofuel production), which preceded another cutback in the enrollment cap (figure 1). Owners of CRP land expiring over 2013-16 faced reenrollment constraints similar to those over the 2007-09 period. A general signup was not held in 2014 or 2015, but short-term (1-year) extensions were offered for qualifying expiring lands. In 2016, the general signup was quite small and restrictive by historical standards, accepting only 22 percent of offered lands, and reducing the ability of contracts to persist.[5] The subsequent analysis provides a detailed discussion of how these limited reenrollment opportunities, coupled with the high crop prices that characterized 2013, may have influenced both the decision and ability of landowners to reenroll in the program, as well as the subsequent land use on lands that exited. In sum, while the conversion of CRP land to crop production largely reflects the private decisions of individual landowners, policy, and program priorities—as informed by market conditions—can also have sizeable effects on the ability of landowners to reenroll and on the volume of expiring CRP land that converts back to crop production.

The National Resources Inventory (NRI) can be used to analyze what has happened to land that has gone into and subsequently exited the general signup CRP. NRI data are available for 1982, 1987, 1992, 1997, and annually from 2000 to 2012. The NRI's inherent panel structure allows one to track the land use of the more than 800,000 individual NRI survey points over time. After exiting the program, the overwhelming majority of land has gone into annual crop production or grass cover/hay production (figure 2). For example, consider 2012 NRI points—approximately 24 million acres—that had been, but were no longer enrolled in the CRP. About 45 percent of these acres were used for annual crop production, compared to 43 percent in grass cover or hay production. A much smaller amount of post-CRP land was in forest cover (7 percent overall, in 2012), with the remainder distributed to other uses (e.g., development). The NRI data reveal several important features of the pattern of post-CRP land use. However, although CRP is listed as a separate category in the NRI land use classification system, only land enrolled through the general CRP signup is identified as such. Thus, land enrolled under continuous CRP, which accounts for roughly one-third (7.9 million acres) of all current CRP land (22.4 million acres), is not identifiable with the NRI data. Land enrolled through the continuous signup tends to be concentrated in the Midwest and Appalachian regions, suggesting that the NRI data will underrepresent CRP land for these areas (figure 3).

[4]Of 27.7 million acres eligible, about 23.3 million acres received a REX extension. As noted in the text, the length of the extension depended on the EBI score of the contract. Specifically, FSA divided expiring contracts into quintiles based on the EBI scores of the land under contract. FSA offered the quintile with the highest EBI scores new 10- or 15-year contracts. The second highest quintiles were offered 5-year contract extensions, the third highest were offered 4-year extensions, and so forth.

[5]Between 1997 and 2014, acceptance rates for CRP general signups fluctuated between 48 percent and 88 percent, with an average of about 70 percent.

Figure 1
Land enrolled in the Conservation Reserve Program (CRP) declined by 13.3 million acres from 2007 to 2016



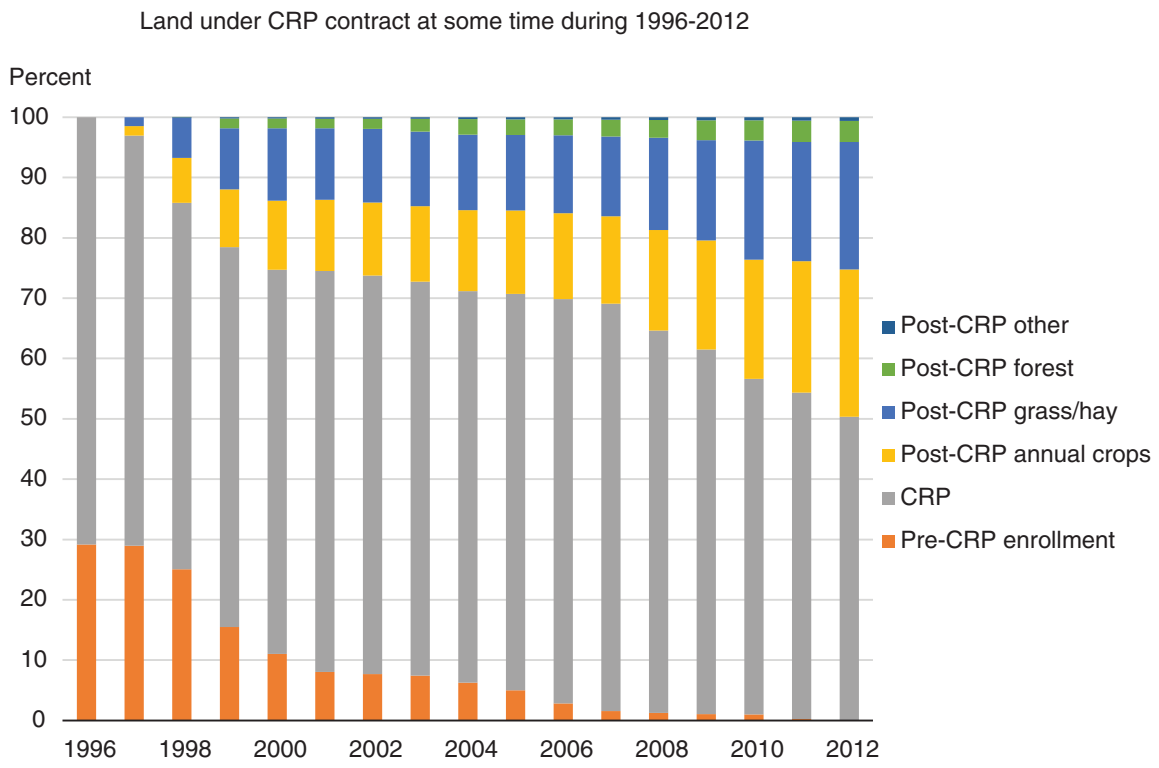
Source: USDA, Economic Research Service calculations using program data from USDA, Farm Service Agency (2018).

The Conservation Reserve Program and the Agriculture Improvement Act of 2018

The Agriculture Improvement Act of 2018, signed into law on December 20, 2018, reauthorizes the CRP through 2023. The 2018 Farm Act gradually increases the CRP cap from 24 million acres to 27 million acres, with at least 8.6 million acres in continuous signup practices and 2 million acres enrolled in the grassland component of the CRP. CRP annual rental payments are limited to 85 percent of the estimated average county rental rate for general signup and 90 percent of the rental rate for continuous signup. In previous CRP signups, annual rental payments could be equal to or higher than estimated county average rental rates. The aim of lower payments, at least in part, is to ensure that CRP payments are not bidding up rents in local cropland markets. Lower bid caps may also reduce enrollment incentives—possibly leading to a reduction in acreage offered to the program. The 2018 Act also: (1) mandates a one-time incentive payment equal to 32.5 percent of the first annual payment for new continuous-signup enrollments, a change that could offset the effect of some of the reduction in the annual rental payment; (2) places new limits on cost-sharing and incentive payments; and (3) expands opportunities for haying and grazing on enrolled acreage. For more information on the latest provisions of the 2018 Farm Act, see "Conservation" in *Agriculture Improvement Act of 2018: Highlights and Implications*.

Figure 2

Land exiting the general signup Conservation Reserve Program typically goes into annual crop production or grass/hay cover

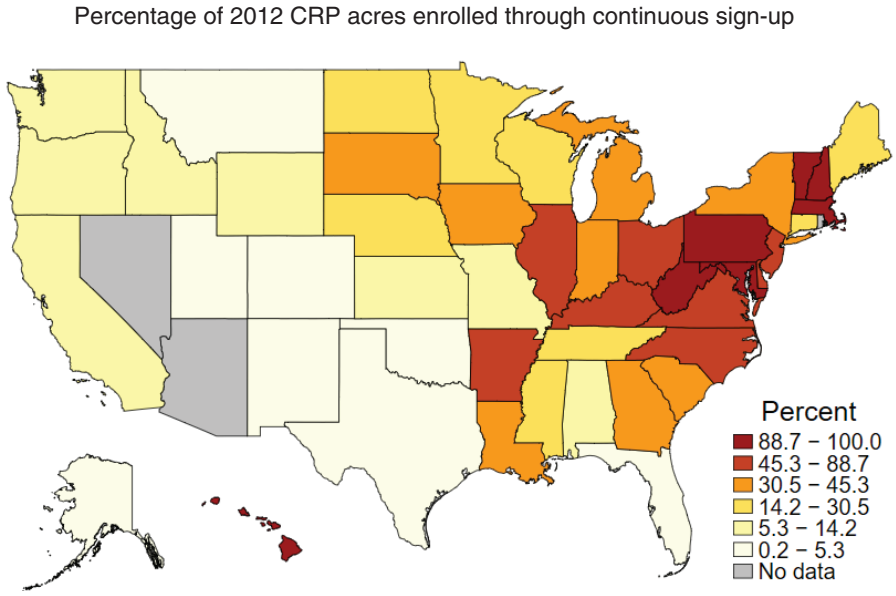


Note: Contracts from the initial implementation of the Conservation Reserve Program (CRP) began expiring at the end of 1996. The "CRP" portion of each bar denotes the amount of land in CRP in that year as a share of all acreage that has been enrolled in the program at some point in time. Land in the "Pre-CRP enrollment" bar represents land which will eventually be enrolled, the vast majority of which is cropland.

Source: USDA, Economic Research Service calculations using National Resources Inventory data from USDA, Natural Resources Conservation Service (2014).

Figure 3

Continuous Conservation Reserve Program (CRP) land tends to be most prevalent in the Midwest and Appalachian regions



Source: USDA, Economic Research Service using data from USDA, Farm Service Agency (2012).

The CRP Enrollment Mechanisms

The Conservation Reserve Program enrolls land through three enrollment mechanisms: "general signups," "continuous signup" (including the Conservation Reserve Enhancement Program), and "grasslands."

- The general signup takes place in most years, and uses a competitive "reverse auction" mechanism, with several week-long open seasons during which landowners can offer parcels to the USDA. Each offer specifies a per-acre asking price, and what conservation practice (or land cover) will be installed. All offers are scored using an Environmental Benefits Index (EBI)—a multi-factor index that includes the erodibility of the parcel, wildlife habitat qualities of the proposed conservation practice, water and air quality impacts from retiring the land, and an asking price. All offers are ranked using the EBI, and the best are accepted. Acceptance rates have varied over time, ranging from 88 percent in 2013 (signup 45) to 21 percent in 2016 (signup 49).

As of July 2019, land enrolled through general signups accounts for 60 percent of CRP acres (13.46 million acres). The average size of a general signup contract is 81 acres, at a cost of $52 per acre.

- Continuous signup, initiated in 1997, is non-competitive but has more stringent eligibility requirements. If land qualifies for the continuous CRP, it can be enrolled at any point in time for a rental rate predetermined by FSA associated with a specified CRP practice to be adopted. Participating continuous CRP landowners therefore forego the competitive reverse auction required for general signup participants. There are a number of continuous signup initiatives and allocations that a parcel can be offered to, such as "wetland restoration," "pollinator habitat," "duck nesting habitat," and "State acres for wildlife enhancement." Each of these has its own requirements, which include geographical (location of parcel) and bio-physical (land characteristics) factors, as well as a set of permitted conservation practices to install.

About 4 percent of CRP land (941 million acres) is in the Conservation Reserve Enhancement Program (CREP)—a subset of continuous signup. CREP consists of a number of Federal/State partnerships designed to address specific issues. These have more specific eligibility requirements and tend to cost more per acre ($162).

As of July 2019, continuous signup accounts for 36 percent of CRP acres (7.96 million). The share of CRP land stemming from the continuous signup has steadily increased over time, increasing from 10 percent of CRP acres in 2007, to 23 percent in 2013, and 31 percent in 2016. The average size of continuous signup contract is 18 acres, at a cost of $139 per acre.

Last, there is a CRP Grasslands component, which helps landowners and operators protect grassland, including plant and animal biodiversity, while continuing to use it for grazing. This component was initiated in 2014 and currently accounts for about 4 percent of CRP acres, which are enrolled at a cost of about $12 per acre.

CRP Reenrollment

Temporal Trends

At the end of the 2012 fiscal year (September 30, 2012), 29.53 million acres were enrolled in the CRP. Over the subsequent 4-year period, spanning 2013 to 2016, roughly one-quarter of that land (8.1 million acres) was associated with an expiring CRP contract (USDA-FSA, 2013a). The database used for this analysis allows us to track 7.6 million (94 percent) of the true amount of expiring land (the aggregate sum of the bars in figure 4).[6] Of the contract expiration years considered, the acreage in expiring CRP contracts declines over time, decreasing from 3.09 million acres in 2013 to 1.18 million acres in 2016.

We estimate that 36 percent (2.76 million acres) of the acreage in expiring CRP contracts during 2013-16 was reenrolled in the CRP.[7,8] The rate of reenrollment is less than 50 percent in each expiration year. Of the CRP land under a contract that expired in 2013, 45 percent was reenrolled; the reenrollment rate was 25 percent in 2014 and 34 percent in both 2015 and 2016.[9] Lackluster reenrollment during our study period was, to a large extent, driven by limited signup opportunities and more attractive non-CRP options (e.g., grazing).

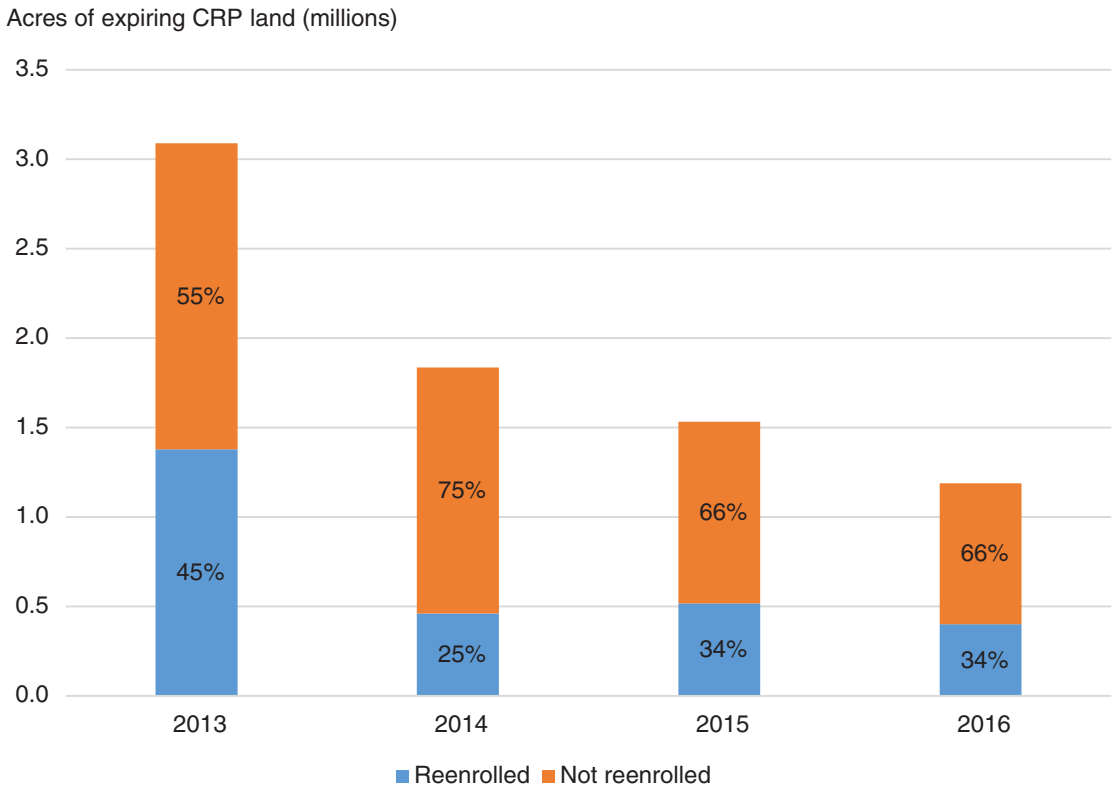
[6]We only include observations in our database if we are confident that the post-contract information on reenrollment and land use is accurate. Observations are dropped if they have a missing ID number, Federal Information Processing Standard Publication (FIPS) code, or unreasonably inconsistent land use acreages (i.e., there are large differences between the reported CRP and CDL (Cropland Data Layer) acreages).

[7]Appendix Tables 2 and 3 provide detail on aggregate reenrollment, as well as reenrollment patterns across CRP signup and practice type.

[8]Our approach to determining what constitutes CRP reenrollment proceeds as follows. First, if a common land unit is in CRP for each successive post-expiration year of compliance crop reporting data, it is considered to be reenrolled. This would be the case if, for example, a contract expires in 2013 and the data show the Common Land Unit (CLU) in CRP for each of the post-expiration years (2014-17). Such cases represent the vast majority of land we consider to be reenrolled. However, there are two exceptions to this general reenrollment rule. The first concerns CLUs that are reconstituted. Sticking with the same example of a 2013 expired contract, if a CLU is observed in CRP in 2014, 2015, and 2016, but then drops out of the compliance database (i.e., is not observed at all in 2017), we define that as a reenrollment since it likely reflects a data measurement issue rather than a contract actually dropping out of the program. These cases account for 14 percent of all reenrolled acreage. The second exception concerns lapses in reenrollment. Again focusing on a 2013 expiring contract, if we observe the CLU in grass or tree cover in 2014 before reverting back to CRP for 2015, 2016, and 2017, we considered it to be reenrolled. For this exception to be granted, we must observe the CLU to be in CRP in the *final* year of the data. The only intervening land uses allowed during the reenrollment lapse are grass and tree cover. If land is observed as being in crop use in any intervening years, we consider it to have exited the program. These reenrollment exceptions account for under 2 percent of the total estimated reenrolled acreage but are important to account for from a conceptual standpoint, as general CRP signups did not occur in 2014 or 2015.

[9]In terms of reenrollment rates, the data used in this report exhibit a small downward bias. Based on official CRP data, the reenrollment rates were 52 percent, 25 percent, 36 percent, and 38 percent, respectively, over the 2013-16 period. Although it is not possible to say with any certainty what is driving this difference, the slight underrepresentation of reenrollment in the CLU-MIDAS database is likely attributable to CLU reconstitution and changes in land ownership that inhibited our ability to track all CLUs associated with an expiring CRP contract over the study period.

Figure 4
Most land associated with expiring Conservation Reserve Program (CRP) contracts over 2013-16 was not reenrolled in the program



Source: USDA, Economic Research Service calculations based on analysis of USDA, Farm Service Agency Common Land Unit (CLU) data (2013-2016).

General Versus Continuous Signup Reenrollment

CRP land can be enrolled through three distinct signup mechanisms. As described in "The CRP enrollment mechanisms" Box, a majority of land is enrolled through a general signup, in which CRP enrollment offers are solicited through a competitive reverse auction. General CRP signups occur for a discrete interval of time, typically several weeks, during which potential program participants must submit their offers. Unlike land eligible for continuous signup, not all eligible and offered land for general signup is accepted into the program. Offers are judged on the basis of an environmental benefits index, which weights the environmental benefits of enrolling the land into the program, as well as the cost of doing so (i.e., the bid). If a bid is high relative to the benefits the land would provide if enrolled, it reduces the likelihood of the land being accepted into the program. This same general principle applies to reenrollments as well; after being accepted once, there is no guarantee or implication that expiring land that is reoffered to the program land will be accepted. If new lands are offered that can be enrolled at a lower cost, relative to benefits, reenrollment offers may not be accepted.

Most of the remaining enrollment is through the continuous signup, which targets environmentally sensitive land where removal from crop production would provide benefits under one of several specific program initiatives or high-priority practices. In contrast to the general signup, offers for qualifying continuous CRP land are automatically accepted. Continuous CRP reenrollment is only constrained by the availability of acreage under the enrollment cap. Since the general and continuous CRP signups have different goals and may produce varied environmental benefits,

it is useful to consider how contract expiration and reenrollment differ by signup mechanism.[10] The final CRP enrollment mechanism, CRP Grasslands, was created in the Agricultural Act of 2014 and, thus, none of the associated contracts had expired over the 2013-16 period.

At the end of fiscal year 2012, there were 24.22 million acres of CRP land enrolled under a general signup (82 percent of all CRP) and 5.30 million acres enrolled under a continuous signup (18 percent). Over the ensuing 4-year period spanning 2013-16, 85 percent of all CRP land set to expire had been enrolled under a general signup (figure 5). General CRP land was reenrolled at a rate of 34 percent, compared to 48 percent for continuous CRP land.[11] With the exception of 2013, when general and continuous CRP reenrollment rates were comparable at 45 and 46 percent, respectively, continuous CRP land has consistently been reenrolled at a much higher rate than general CPR land. In 2014 and 2016, the reenrollment disparity was particularly large, with continuous CRP land being reenrolled at respective rates of 46 percent and 49 percent, at least twice that of general CRP (23 percent in both years).

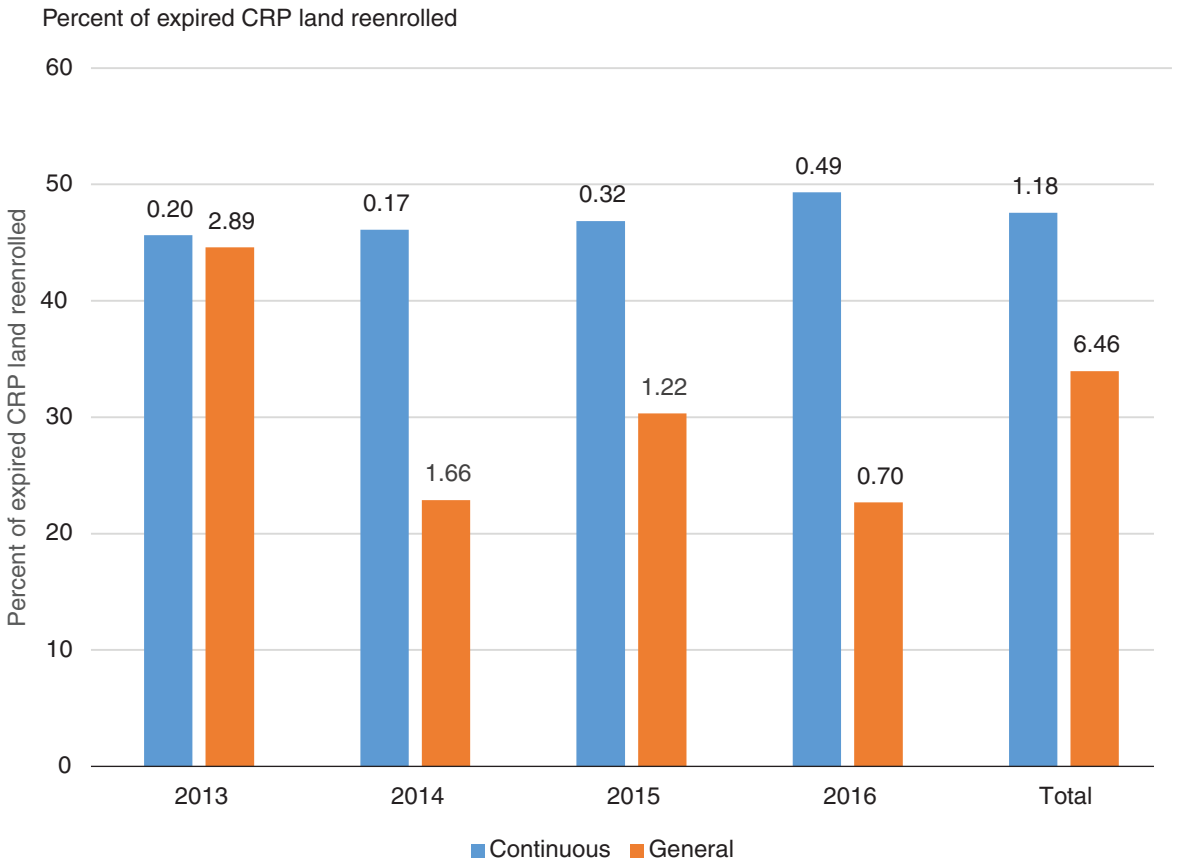
The disparity between general and continuous signup reenrollment is at least partly attributable to the lack of signup opportunities offered to general CRP participants through FSA over this time period. During the 2013-16 period, FSA held two signups, a relatively large one in May-June 2013 (signup #45; approx. 1.57 million acres) and a smaller one in Dec. 2015-Feb. 2016 (signup #49; approx. 390,000 acres). While both signups provided an opportunity for reenrollment in the program, signup #49, in addition to being small in terms of acreage, had a high rejection rate, accepting just 22 percent of the land offered into the program, which is far lower than the 88 percent acceptance rate of signup #45 (USDA-FSA 2013b, 2016). Furthermore, just 49 percent of expiring general CRP land was reoffered into the program in 2013, a historic low that contrasts with an aggregate reoffer rate of 79 percent since the program's inception. The low reoffer and acceptance rates in 2013 may be explained by several factors. For one, the CRP national acreage enrollment cap was cut sharply in the Food, Conservation, and Energy Act of 2008 (figure 1), which lowered the number of acres that FSA could accept. That reduced acceptance may have fed some landowners' doubts that their land would be accepted into the program if offered. In addition, the prices of several major crop commodities, including corn, soybeans, and wheat, were at or near record-setting levels around the same time period, increasing the opportunity cost of participating in the program for many producers in 2013. At 75 percent, the reoffer rate in 2016 was more in line with historical norms.

[10]The database used in this report does not explicitly classify land as being enrolled through the general or continuous CRP signup. Rather, the data contain information on the practice associated with that land. Some CRP practices have enrollment under both the general and continuous CRP signups. For these practices, we assign the signup type with the most acreage, based on Farm Service Agency records. Appendix 1 contains a list of the different CRP practices and their classification as a general or continuous practice. Note that a specific practice was not listed for 1 percent of the expiring CRP acreage. For these CLUs, we assume the land had been enrolled under the general CRP signup.

[11]The CRP reenrollment rates reported here represent the combined reenrollment into both the general and continuous CRP. Our data do not allow us to differentiate between whether the land was reenrolled under a general or continuous signup. Based on personal communication with Catherine Feather of USDA, Farm Production and Conservation Business Center ((FPAC-BC), reenrollment of expiring general signup land into the continuous CRP—e.g., under State Acres For wildlife Enhancement (SAFE)—was not uncommon during this period.

Figure 5

Conservation Reserve Program (CRP) land originally enrolled through the continuous signup is more likely to be reenrolled



Note: The numbers above each bar denote the acreage (in millions) of expiring land in that signup type for each year.

Source: USDA, Economic Research Service calculations based on analysis of USDA, Farm Service Agency Common Land Unit (CLU) data (2013-2016).

Although general signups typically take place every year, 2014 and 2015 were exceptions in that no signup was offered. In lieu of a signup, owners of expiring acreage were given an opportunity to extend their contract for 1 additional year. For owners of land that expired in 2014, they had the opportunity to sign successive 1-year extensions for 2015 and 2016. Likewise, for land expiring in 2015, the contract could be extended into 2016.[12] The only constraint on eligibility for these 1-year extensions is that they could not make the total contract length exceed 15 years. This rendered many general CRP contracts ineligible for the extensions because, in 2007, a broad-based general CRP contract extension effort, known as REX (reenrollment and extension), took place, extending contracts that were due to expire over 2007-10 for anywhere from 2 to 5 years, depending on the EBI score assigned to the land. As a result of the widespread participation in REX, only 46 percent of

[12]For the purpose of this analysis, a 1-year contract extension, in and of itself, is not sufficient for a CLU to be considered reenrolled. For instance, if a contract expires in 2014, is given a 1-year extension in 2015, but then is not accepted into the CRP under signup 49 in 2016, the land is not considered to be reenrolled. Put differently, we only use the extensions to form a bridge between signups #45 and #49. The only possible exception to this rule is for CLUs that are reconstituted in 2014 or 2015, which we do not observe after the extension occurs. These CLUs would be considered to be reenrolled (again, as long as the final observation years list them as being in CRP), but account for a small fraction of overall reenrollment.

total expiring general CRP land was eligible for an extension in 2014-15 (USDA-FSA 2014, 2015). Of the remaining 54 percent of expiring land that was eligible for an extension, only 58 percent was extended by landowners. In addition, as noted above, the general signup that took place in 2016 (#49) accepted relatively few acres into the program.

In contrast to the lack of reenrollment opportunities for general CRP participants, continuous CRP land was not under any particular restrictions that inhibited reenrollment during the study period. Notwithstanding the lack of reenrollment opportunities for general CRP land, given the targeted nature of continuous CRP, coupled with its higher rental payments, continuous land may also be inherently less likely to exit the program upon contract expiration. It bears mentioning, however, that continuous CRP land tends to be concentrated in areas with relatively high crop production potential (e.g., Illinois). All told, despite the fact that continuous CRP land was more likely than general CRP land to be reenrolled, it remains that more than half of expiring CRP land exited the program across all signup types and years.

Regional Trends/Geographic Patterns in Reenrollment

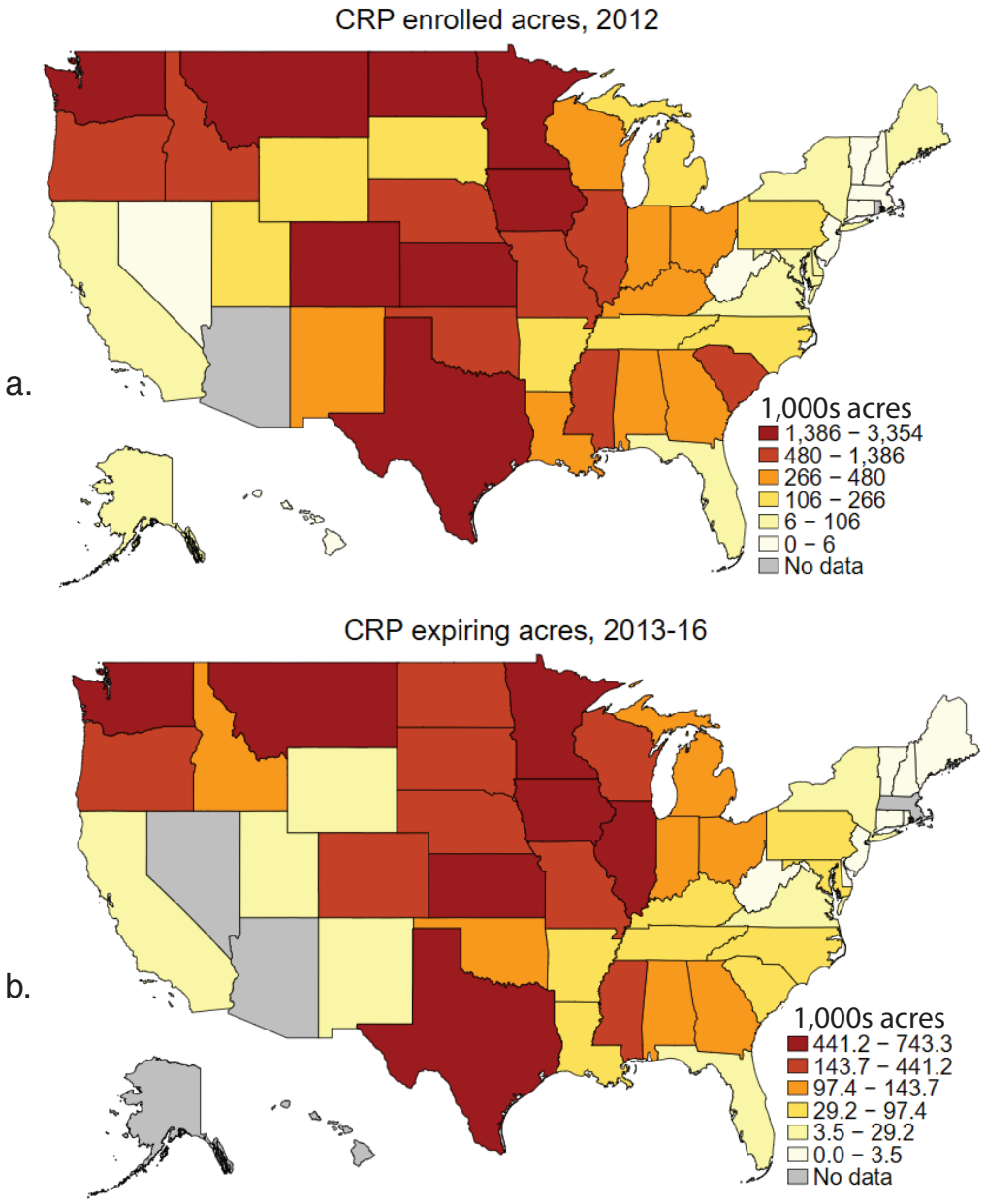
There is considerable geographic variation in the location of land in CRP contracts expiring over 2013-16 (figure 6). In terms of acreage, the five States with the largest amounts of expiring CRP land are Montana (743,000 acres), Texas (690,000 acres), Washington (610,000 acres), Kansas (532,000 acres), and Illinois (471,000 acres). Overall, 22 States had at least 100,000 acres of land in expiring contracts—a threshold that also distinguishes States above the median in terms of expiring acreage. Expiring CRP land is dispersed throughout the United States, with the bulk found in States in the upper Midwest, Plains, and Northwest regions. The share of the total 2012 CRP land base represented by the expiring acreage also varies across States. Among the States with at least 100,000 expiring CRP acres, the largest expiration shares are found in the Midwest (Michigan, 50 percent; Illinois, 46 percent; and Indiana, 40 percent) and Washington (41 percent). The Midwestern States also have relatively high concentrations of land enrolled through the continuous signup (see fig 3). These relatively large shares of CRP land represented by expiring CRP contracts contrast with relatively low shares found in the Plains States of Oklahoma (17 percent), South Dakota (18 percent), and North Dakota (18 percent), where continuous CRP enrollment is also comparatively low.

In most States, less than half of the expired CRP land was subsequently reenrolled in the program (figure 6). For States with large amounts of expiring land (more than 100,000 acres), exceptions include Mississippi (67 percent), Iowa (52 percent), and Idaho (51 percent). In addition, although they have comparatively small amounts of expiring land, Louisiana (80,000 expiring acres, 71 percent reenrolled), Arkansas (54,000 expiring acres, 54 percent reenrolled), Utah (10,000 expiring acres, 51 percent reenrolled), and New Mexico (18,000 expiring acres, 50 percent reenrolled) also have high rates of CRP reenrollment. Montana, the State with the largest acreage of expiring CRP land, also has the lowest rate of reenrollment (14 percent), followed by North Dakota (21 percent), Michigan (22 percent), Minnesota (24 percent), and Wisconsin (25 percent). Although they have relatively minor amounts of expiring CRP land, North Carolina (40,000 acres, 16 percent reenrolled) and New York (15,000 acres, 16 percent reenrolled) are also associated with low reenrollment rates.

A variety of factors drive State-level variation in CRP reenrollment. One obvious influence is the availability of signup opportunities. In general, States with a larger share of expiring land in continuous CRP tend to have higher reenrollment rates (e.g., Mississippi, Iowa, Illinois, and Indiana). As noted above, general signup opportunities were lacking over 2013-16, and reenrollment rates were particularly low for contracts expiring in the final 3 years of the period (2014-16). For contracts

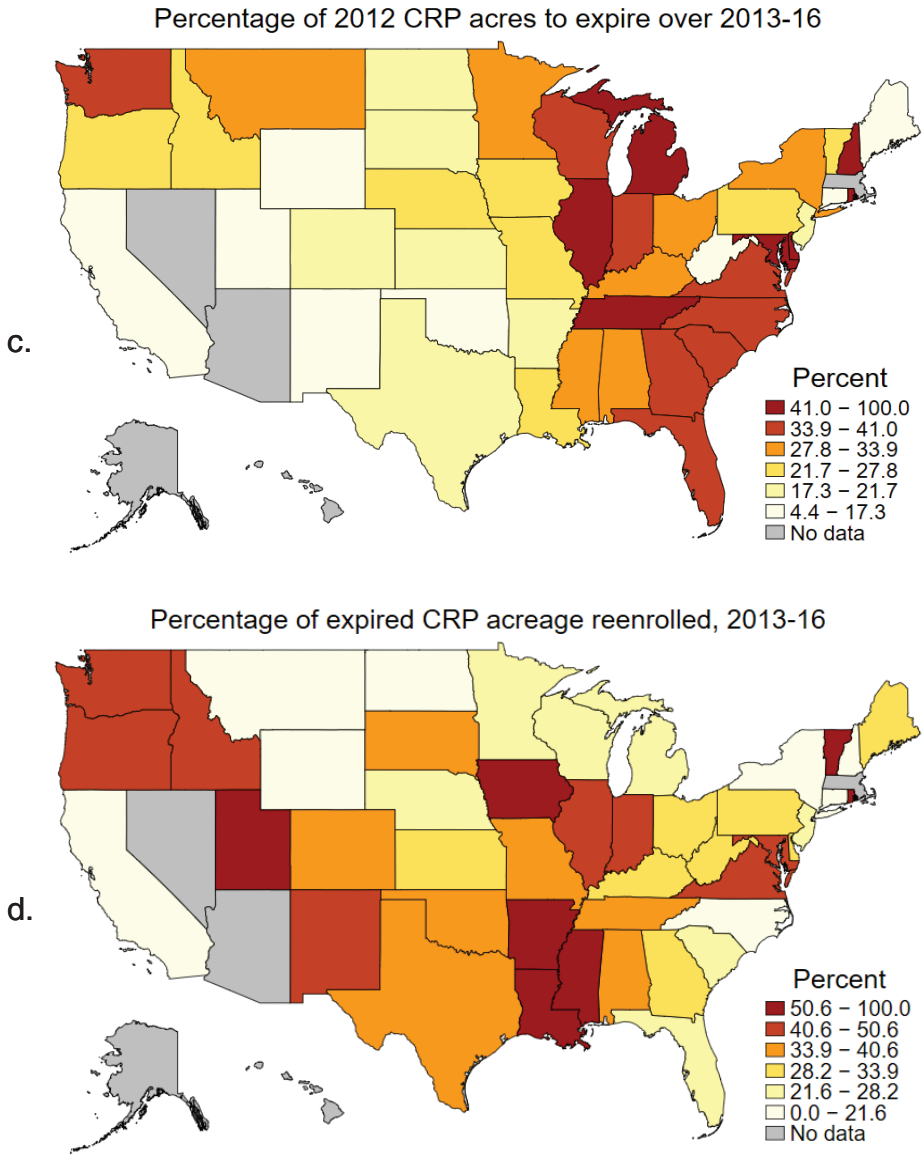
expiring over 2014-16, there is a strong negative correlation (-0.33) between the share of expiring land reenrolled and the share of expiring land that was originally enrolled through the general CRP signup. This contrasts with a smaller correlation of -0.17 for 2013, when general signup opportunities were arguably greatest over the study period. Several States where a relatively small proportion of expiring acreage was originally enrolled through general signup (Mississippi, 40 percent; Iowa, 45 percent; and Arkansas, 65 percent) over 2014-16 have high rates of reenrollment (67 percent, 52 percent, and 55 percent, respectively). This aggregate pattern does not hold in all cases, however. In New York, for example, 51 percent of land of expiring land was enrolled through the continuous signup but reenrollment was only 12 percent over the same period. Reenrollment opportunities were arguably lowest for general signup participants in 2016, when a small, selective signup was held after offering 1-year contract extensions in 2014 and 2015.

Figure 6
Conservation Reserve Program (CRP) reenrollment varies across the United States, contracts expiring over 2013-16



–continued

Figure 6
Conservation Reserve Program (CRP) reenrollment varies across the United States, contracts expiring over 2013-16 –continued



Source: USDA, Economic Research Service calculations based on analysis of USDA, Farm Service Agency Common Land Unit (CLU) data (2013-2016).

In 2016, the correlation between the reenrollment rate and the share of expiring land in the general signup was much larger in magnitude, at -0.45. Although signup opportunities play a role in reenrollment trends and patterns, they cannot explain all of the variation in observed reenrollment outcomes. Other factors that influence reenrollment decisions include non-CRP land use opportunities (discussed in the "Post-CRP land use" section), differences in production conditions and the type and quality of expiring land, and idiosyncratic landowner preferences.

Practice-Specific Trends in Reenrollment

CRP land has the potential to provide a wide array of ecosystem services. The program was originally designed to mitigate soil erosion, but environmental goals have since evolved to target additional aspects of environmental quality, such as water quality, wildlife habitat, and wetland preservation. When land is enrolled into the CRP, it is accepted under the condition that a specific conservation practice will be put in place. As of July 2019, there were 43 different practices that could be installed on CRP land. These practices can be grouped into four broad categories: grass, tree, wetland, and wildlife habitat.[13,14] Given that CRP acreage enrollment is limited by National and county-specific enrollment caps, there are inherent tradeoffs associated with enrolling land that will provide one type of benefit over another.[15] Similar tensions emerge with respect to CRP contract expiration and reenrollment. For many CRP practices, the environmental benefits (e.g., erosion control) may be lost if expiring land returns to crop production. However, after being enrolled for the previous 10 years, the land may also be more suitable for a return to crop production (or livestock grazing) when the contract expires because of the gains to soil health accrued over the CRP contract period.

For land under grass practices exiting the CRP, suitable replacement parcels may be relatively easy to find, suggesting that there may be a displacement, but not necessarily a discontinuation, of the associated benefits. Other types of conservation practices, such as those involving wetlands restoration/protection, produce a wide array of environmental quality benefits (waterfowl and other species habitat, groundwater recharge, sediment removal), as well as recreational opportunities (e.g., bird watching and duck hunting), which may be more unique to specific parcels (Hansen et al., 2015), implying that the benefits may be more difficult to replace if the land exits the program.

CRP practices also vary in terms of establishment costs and the relative ease with which a parcel can transition back and forth between being used for agricultural production and conservation cover. Tree practices, for example, have high installation costs and are costly to return to crop production once trees are established, which may dissuade landowners from removing land from the program. Of course, to some degree, it is also likely that landowners will install tree cover only on lands they intend to keep in conservation for an extended period. CRP grass practices, on the other hand, have lower installation costs and are less costly to return to agricultural production.

As illustrated in Figure 7, the majority of expiring land had been previously enrolled for a grass practice (56 percent), followed by wetland (17 percent), wildlife (16 percent), and tree (9 percent) practices (see Appendix Tables 2 and 3 for further details). Overall, CRP land associated with tree practices was the most likely, at a rate of 47 percent, to be reenrolled in the program (figure 8), while land associated with wildlife practices was least likely, at a rate of just 29 percent. For all expiring

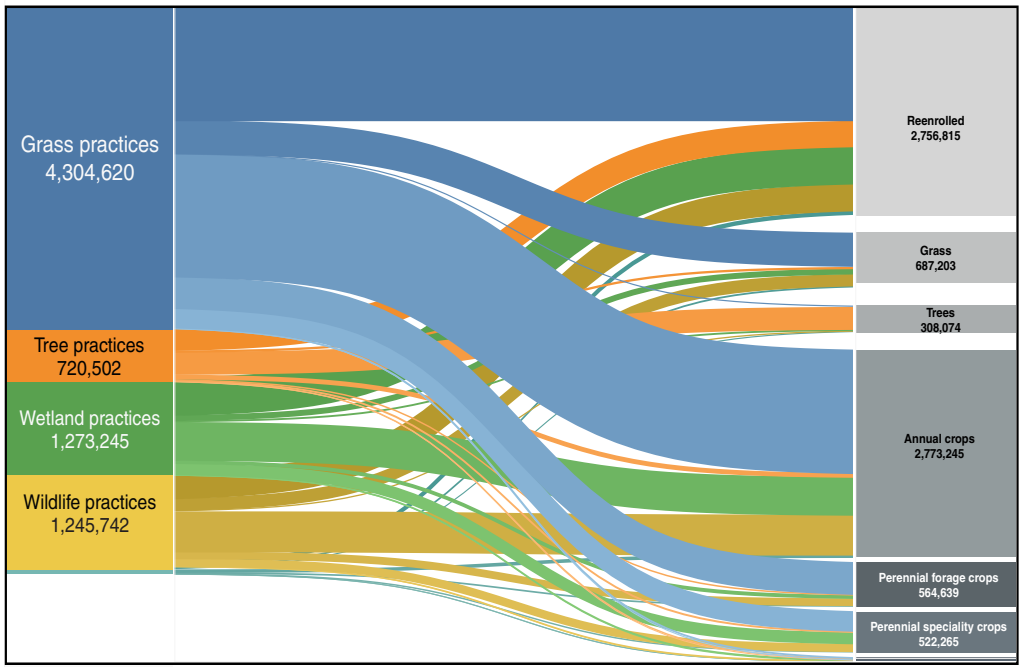
[13]The assignment of a specific practice into one of these four categories does not imply that it only provides environmental benefits related to that particular category. Rather, we assign the category that, to our knowledge, best represents the goals of that particular practice. For example, CP37 (Duck Nesting Habitat) is classified as a wildlife practice but may also provide environmental benefits in the form of wetland preservation.

[14]In Appendix 1, we provide a list of how the different CRP practices with expiring acres were grouped into these four broad classifications. In addition to the four categories studied in the text (grass, trees, wildlife, and wetlands), we also have an "other" practice category, which comprises the 1 percent of expiring acreage without a specific practice identified in our data. Expiring land with practices CP26 (sediment control structure) and CP34 (flood control structure), which represent just 12 acres, also fall into the other practice category. In total, the other category represents just over 1 percent of all expiring CRP acreage over 2013-16.

[15]The National acreage enrollment cap is displayed in figure 1. In addition, CRP enrollment generally cannot make up more than 25 percent of an individual county's cropland acreage.

CRP acres, land with wetland and grass practices installed had reenrollment rates of 39 and 35 percent, respectively. Reenrollment was most common for land with tree practices in all but 1 year over 2013-16, with the exception being in 2015 when wetland practices had the highest rate of reenrollment (46 percent). The differences in reenrollment rates across practice types were starkest in 2016, when 59 percent of land with tree practices was reenrolled, compared to 24 and 25 percent of land enrolled under grass and wildlife practices, respectively. The temporal pattern of reenrollment across CRP practice types generally accords with the differences between general and continuous CRP reenrollment. Overall, although each practice type features a mix of land enrolled in the general and continuous signup, most expiring land under grass and wildlife practices (97 percent and 90 percent, respectively) was from the general signup, while the opposite holds for wetland practices, where only 37 percent was from the general signup. For tree practices, 80 percent of expiring acreage came from the general CRP signup.

Figure 7
CRP transition: From conservation cover to post-expiration land use for all CRP land that expired between 2013 and 2016.

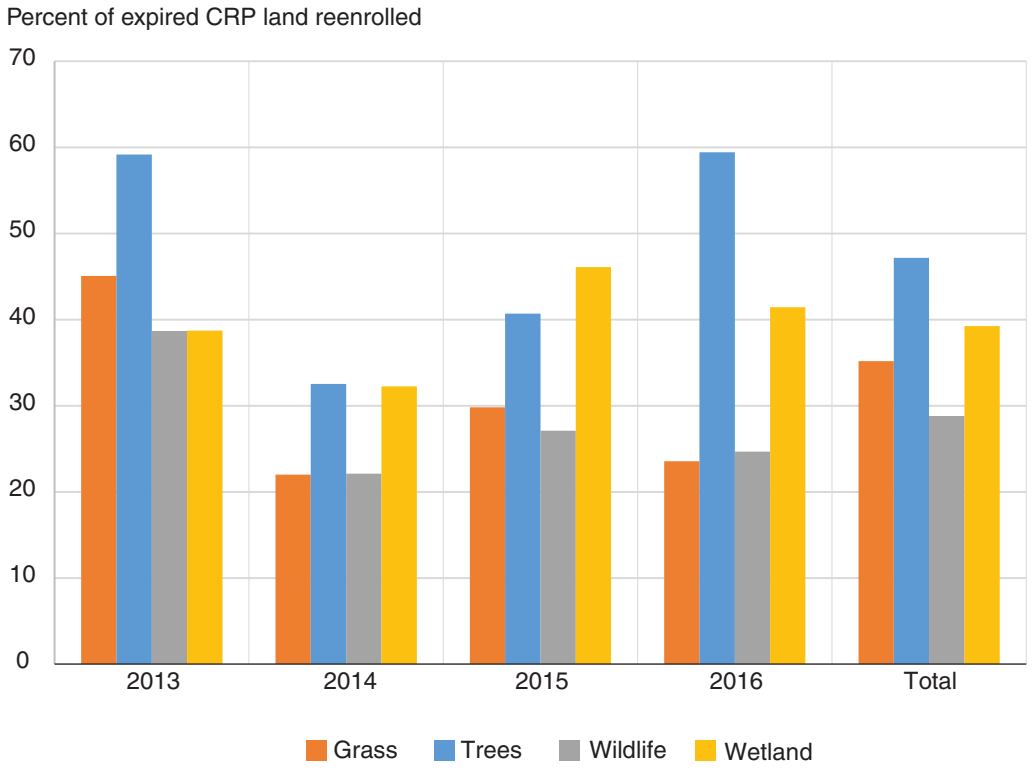


Source: USDA, Economic Research Service calculations based on analysis of USDA, Farm Service Agency Common Land Unit (CLU) data (2013-2016).

Given the startup costs associated with tree planting, it makes intuitive sense that landowners would be interested in keeping their land in the CRP for an extended period of time (e.g., multiple contracts), which is reinforced by the high costs associated with clearing land planted to trees and converting it back to crop production. Tree-practice land is also associated with the most variable reenrollment rate, which is in part due to the fact that tree practices tend to be concentrated in the Southeast (Mississippi, Georgia, Louisiana, and Alabama). In the Southeast, reenrollment rates have varied widely—specifically, Mississippi and Louisiana have reenrollment rates that are quite high, while Georgia has a very low reenrollment rate. Variability in the reenrollment rate stems from the incidence of tree-practice contract expiration across these States. For example, a large share of Georgia's tree-practice land expired in 2014, while most of Mississippi's tree-practice land expired in 2016. The variability in tree-practice reenrollment is thus largely a function of when and where contract expirations occurred.

Figure 8

Tree practices are associated with the highest rate of Conservation Reserve Program (CRP) reenrollment



Source: USDA, Economic Research Service calculations based on analysis of USDA, Farm Service Agency Common Land Unit (CLU) data (2013-2016).

Post-CRP Land Use for Land That Exits the Program

Temporal Trends in Post-CRP Land Use

How CRP contract expiration affects the environment depends on how former CRP land is used after it exits the program. If a contract expires, and the land is retained in grass or tree cover, many (or all) of the conservation benefits, such as soil erosion control and wildlife habitat provision, are likely to endure. In contrast, a reversion of expired CRP land to crop production is likely to result in loss of many of the environmental benefits of CRP enrollment. These losses may be offset as new land enters the program, and exiting land may have greater crop productivity due to enhancements in soil health over the CRP contract period.

The landscape-level environmental implications of post-CRP land use decisions are influenced by the cover type associated with the CRP practice previously in place. For instance, the exit from the program of former CRP wetlands parcels, with their location-specific array of multiple benefits, may be more consequential than the conversion of a parcel that had been enrolled for a grass-cover practice. Likewise, effects on the environment also hinge on how the land is actually used upon exiting the CRP. Land used for grazing, while likely producing fewer environmental benefits than managed grassland under the CRP, will in many instances result in a lower net loss of benefits than would a conversion to cropland.

Beyond environmental implications, post-CRP land use patterns are highly relevant to the structure of CRP contract rental payments. If expired CRP land that is not reenrolled does not revert back to crop production, the CRP rental payments given to the landowners to keep their land out of production may be inefficient, since environmental benefits will continue to be realized even in the absence of CRP payments. However, the CRP itself may have provided the transitional payments needed to induce the landowner to retire the land. On the other hand, if land that expires immediately reverts back to crop production, it suggests the rental payments may have been required to retain land in the program. Although the present study sheds some light on the durability of post-contract CRP land uses, we note that the relatively short time horizon covered by our data is insufficient to say anything definitive about the permanence of CRP-induced land use change.

Over 2013-16, 57 percent of land that exited the CRP and was not reenrolled transitioned to annual crop production (figure 9).[16,17] The 57 percent of land that exited translates to 36 percent of *all* expiring land (i.e., including reenrolled land) over the same period. In each year, at least half of the exiting CRP land transitioned to annual crop production, with the shares ranging from 50 percent for land that expired in 2015 to 65 percent for land that expired in 2013. Aggregated across all expiration years, the most common annual crops grown on expired CRP land were soybeans (21 percent of

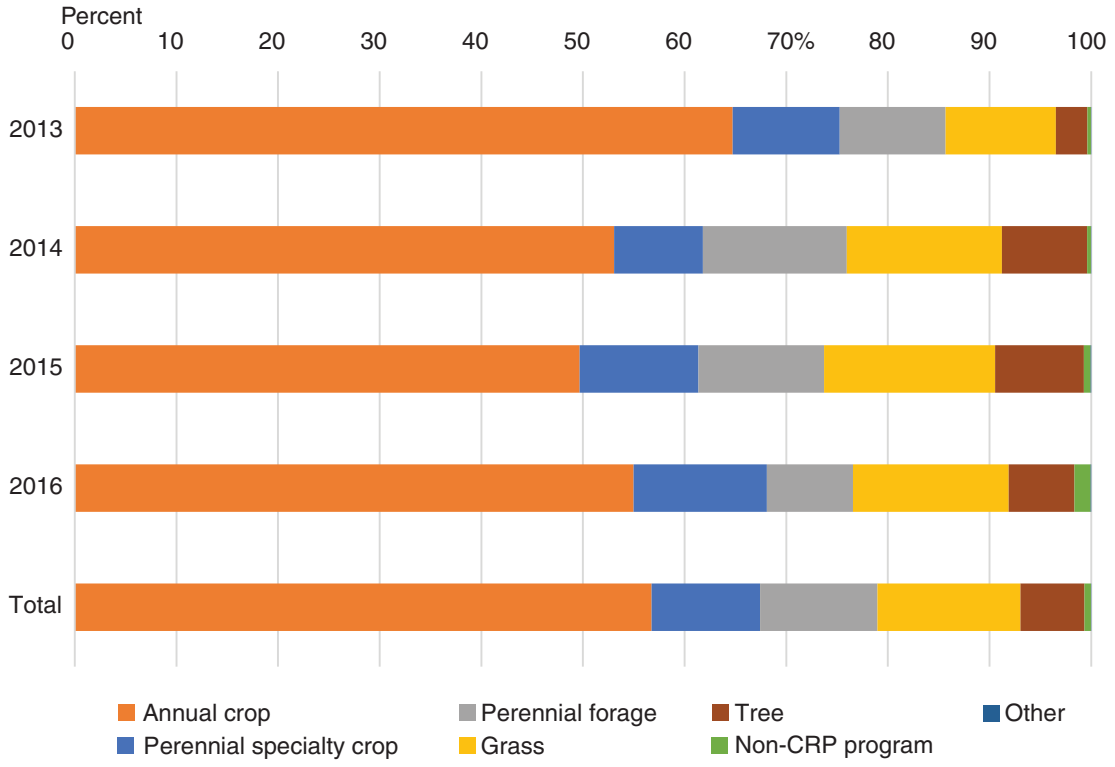
[16]Appendix Tables 2 and 3 provide detail on aggregate post-CRP land use, as well as land use patterns across CRP signup and practice type.

[17]To determine the post-CRP land use for CLUs that exited the program, where available, we use data from the MIDAS crop reporting compliance database. If the observation is missing from the compliance data, we use geospatial data from the Cropland Data Layer (CDL) as a substitute. Overall, 57 percent of the land use acreage for exiting CLUs comes from the compliance data and 43 percent from the CDL. In assigning land use to each CLU that exited CRP, we use the following hierarchy: If in any year the dominant use was annual crops, we assume that CLU has transitioned back to annual crop production, and likewise for the perennial specialty crop and forage crop categories. Thus, for land to be assigned to post-CRP grass cover (or tree cover), it cannot have been observed to be used for crop production in any post-contract year. As discussed further below, we make an exception to this land use assignment rule for tree practices, where partial field enrollment is quite common.

all land that exited and went into annual crop production), corn (16 percent), and wheat (16 percent), with most of the corn and soybean land likely being used in a corn-soybean rotation. Sixteen percent of former CRP land in annual crop production remained fallow, although part of this share may have represented a transitional cover before the land converted back to production. Perennial forage (e.g., alfalfa) and specialty crop (e.g., orchards) production comprised 12 and 11 percent, respectively, of exiting CRP land. Pecans, largely found throughout the Southern United States, have been the most common type of specialty crop grown on former CRP land. Taken together, these results indicate that 81 percent of former CRP land was put to some type of crop production (annual, perennial forage, or perennial specialty) after exiting the program.

The remaining exiting land was spread between grass cover (14 percent), tree cover (4 percent), non-CRP conservation program participation, excluding working lands programs (1 percent), and other uses—e.g., development—(< 1 percent). Post-CRP acreage under grass cover may represent acres that are untouched after expiring from a grassland practice in CRP or may be used as pastureland.

Figure 9
Most land exiting the Conservation Reserve Program (CRP) between 2013 and 2016 was subsequently used for annual crop production



Source: USDA, Economic Research Service calculations based on analysis of USDA, Farm Service Agency (FSA) Common Land Unit (CLU) data, FSA Modernize and Innovate the Delivery of Agricultural Systems (MIDAS) program data, and USDA, National Agricultural Statistics Service Cropland Data Layer (2013-2016).

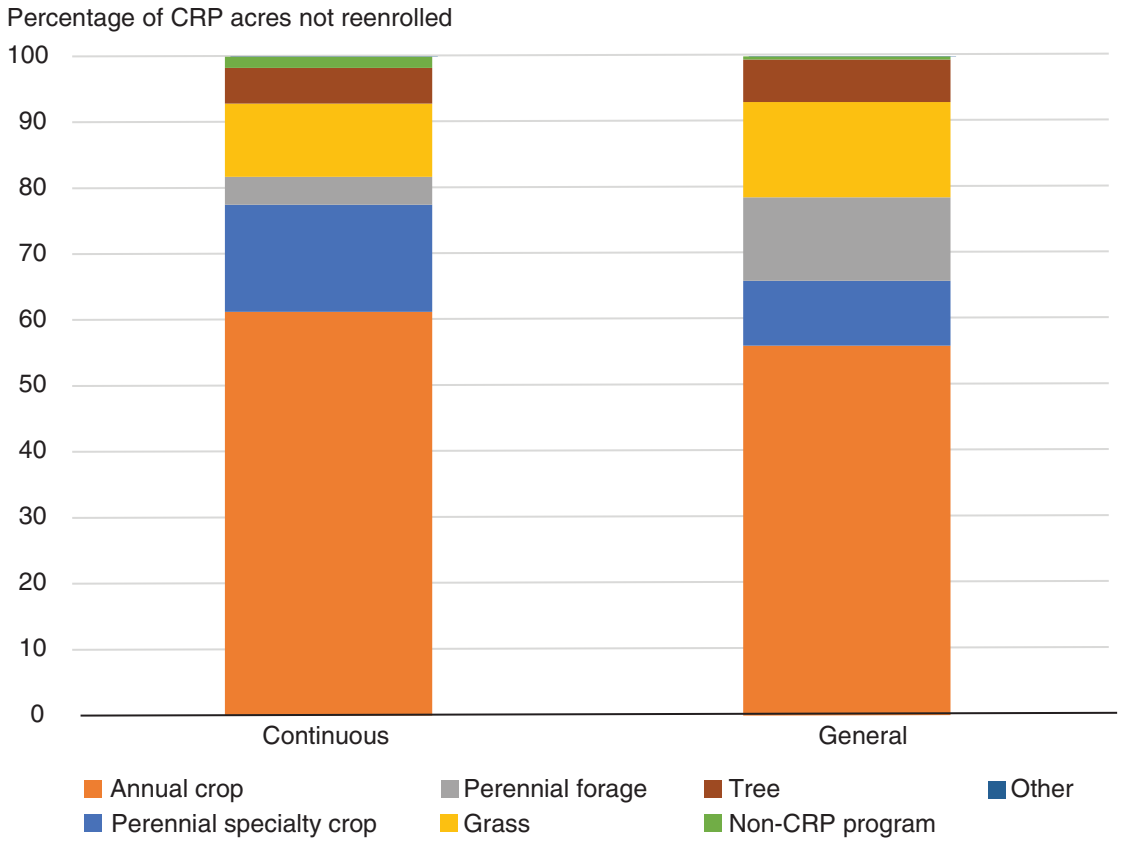
Many factors drive post-CRP land use outcomes, including prevailing market conditions for different types of agricultural products. The changes in land use patterns shown in figure 9 are broadly consistent with the patterns in crop and livestock prices received by farmers over 2013-16. According to USDA, NASS (2019), in September 2013 (when CRP contracts hit their fiscal year 2013 expiration date) livestock prices were 7 percent higher than crop prices (relative to 2011 price levels).

The relative difference grew as crop prices continued to fall, amounting to an average relative gain of 31 percent for livestock prices over 2014 and 39 percent over 2015, before coming back down to 16 percent during 2016. Contracts expiring in 2013 were associated with the largest share of exited land returning to crop production, followed by 2016, 2014, and 2015, which coincides with the incentives conveyed by trends in the relative crop and livestock prices over the same period. Similarly, 2014 and 2015—years when the relative price of livestock output was highest—were associated with the largest combined shares of exiting CRP land devoted to forage crop production or grass cover (29 percent). Although a more rigorous modeling effort would be needed to determine the extent to which these relative price differences influenced owners of expiring CRP land, at least some correlation is apparent between the market incentives faced by CRP landowners and their post-CRP land use choices.

General Versus Continuous Signup Trends in Post-CRP Land Use

For both signup types, general and continuous, land that exits the CRP most commonly transitions into annual crop production (figure 10). During 2013-2016 annual and perennial crop production were both more common on former continuous than former general CRP land. Annual crops were produced on 61 percent of exiting continuous land versus 57 percent of exiting general land, and perennial specialty crops were produced on 16 percent of exiting continuous land versus 11 percent of exiting general land.

Figure 10
Exiting continuous Conservation Reserve Program (CRP) land is more likely to convert to crop production, contracts expiring over 2013-16



Source: USDA, Economic Research Service calculations based on analysis of USDA, Farm Service Agency Common Land Unit (CLU) data, FSA Modernize and Innovate the Delivery of Agricultural Systems (MIDAS) program data, and USDA, National Agricultural Statistics Service Cropland Data Layer (2013-2016).

In contrast, perennial forage and grass cover production was more common on general CRP land (13 percent perennial forage, 14 percent grass) that exited the program, compared to former continuous CRP land (4 percent perennial forage, 11 percent grass). Given that nearly all land using CRP grass practices came from the general signup, it makes sense that expired general CRP land would have a higher rate of use for grass and forage cover than expired continuous CRP land. The rate of general signup land going into post-contract grass cover increases over time, from 11 percent in 2013 to 15, 18, and 18 percent, respectively, in 2014, 2015, and 2016. This trend suggests that some landowners may have wanted and attempted to reenroll their land, but their bids were not accepted under signup #49.

The greater incidence of higher valued agricultural production (annual and specialty crop production) on continuous CRP land is, to some extent, intuitive and explainable by self-selection. Since continuous CRP land commands higher program rental rates, land of higher production value may be drawn into the program, and the opportunity cost of not producing after exiting the program may be higher for those lands. In addition, continuous CRP represents a large share of total program acreage in several States (e.g., Illinois) characterized by high-valued commodity crop production. In aggregate, owners of the continuous land that exits would therefore be more likely to put their land to more profitable agricultural uses, such as annual or specialty crop production. In addition, exit of continuous CRP land is more likely to be deliberate from a landowner decision-making standpoint, since landowners can always reenroll their land (subject to the availability of acreage under the enrollment cap). A corollary to this pattern, however, is that more environmental benefits may be lost on exiting continuous CRP land as it is put to more intensive post-CRP uses because continuous CRP land is typically more valuable from a conservation standpoint. For example, some land in the continuous CRP is enrolled for the purpose of establishing riparian buffers to filter agricultural nutrient runoff and promote water quality. Given its location, this land is likely more productive from an agricultural standpoint than general CRP land, but also may provide significant conservation value, much of which will not persist if the land is converted back to crop production.

Regional Trends/Geographic Patterns in Post-CRP Land Use

Although annual crop production is the most common post-CRP land use, there is considerable variability across States. For instance, during 2013-2016, several States, including Kansas (36 percent), Nebraska (33 percent), Oregon (33 percent), Texas (30 percent), and Colorado (28 percent), had post-CRP grass shares that were at least twice the national share of 14 percent (table 1). The States with high rates of post-CRP grass cover all generally had relatively low rates of post-CRP annual crop production. Oklahoma, at 63 percent, had the largest post-CRP grass share and one of the lowest annual crop shares (29 percent).

Annual crop conversion is generally high in the Midwest, where many States had post-CRP annual crop shares in excess of 70 percent (Ohio, Michigan, Iowa, Minnesota, and Missouri). Not surprisingly, these are States where annual crop production tends to be most profitable. Kentucky (74 percent) and Washington (69 percent) also had relatively high shares of annual crop conversion. Western States, including those located in the Plains region, tended to have relatively high shares of perennial forage (e.g., Montana, Texas, and Oregon). Post-CRP tree shares far exceeded the National percentage in several Southeast States, namely Georgia (92 percent) and Mississippi (63 percent) due to the concentration of CRP tree practices in those States.

The highest rates of crop conversion tend to be found in States with a large share of land enrolled through the continuous signup, namely those throughout the Corn Belt and eastern Appalachian regions. Low crop conversion rates have often been in States with minimal continuous land exiting

the CRP, such as Texas, Oklahoma, and Colorado. Montana and Washington are exceptions, with low shares of continuous exiting land (not shown) and relatively high rates of crop conversion. Likewise, Georgia has had very little exiting continuous acreage and post-CRP crop production. For the States with an above-median level of exiting CRP acreage (table 1), the correlation between the share of exiting acreage that had been enrolled in the continuous signup and the share subsequently converted to annual or specialty crop production was 0.34. Within States, we further find that exiting continuous land tends to be more likely to convert to annual or specialty crop production. Of the 22 States listed in table 1, 16 had a higher rate of combined annual and specialty crop conversion on expired continuous signup CRP land than they had for expired general signup CRP land.

Table 1
Use of land after exiting the Conservation Reserve Program (CRP) varies across States, contracts expiring over 2013-16

State	Annual crop	Perennial forage crop	Perennial specialty crop	Grass	Tree	Exiting continuous	Acres exiting
	----- Percent -----						
Georgia	5.2	0.2	0.9	0.2	91.5	2.2	84,099
Mississippi	25.9	0.5	6.1	3.7	63.2	49.9	88,281
Oklahoma	29.2	0.4	6.7	63.4	0.1	1.5	85,838
Oregon	40.1	20.5	5.6	33.4	0.1	7.2	82,389
Texas	39.6	19.8	10.3	29.6	0.3	2.6	413,708
Colorado	48.3	16.8	6.4	28.4	0.1	0.9	272,462
South Dakota	47.6	13.4	14.2	20.1	3.0	17.6	130,551
Kansas	54.2	0.2	9.4	35.9	0.0	8.0	351,598
Nebraska	54.3	0.9	10.3	32.9	1.2	10.2	198,404
Montana	62.9	29.8	6.0	1.3	0.0	0.7	639,135
Idaho	53.5	6.9	19.3	18.8	1.2	3.3	70,395
Wisconsin	61.1	2.9	12.7	9.0	13.7	12.6	108,784
Missouri	69.8	14.5	7.3	6.2	1.5	13.3	206,806
North Dakota	61.9	17.7	17.0	2.2	0.3	7.3	343,498
Indiana	65.3	4.3	14.0	8.0	6.0	36.8	65,720
Washington	68.8	14.5	10.6	6.0	0.1	6.0	336,374
Kentucky	74.5	8.7	7.1	6.2	1.6	33.6	69,100
Illinois	67.3	4.0	15.0	8.6	4.3	33.5	252,947
Iowa	70.7	5.0	14.6	8.0	1.1	44.5	214,194
Michigan	72.2	1.5	13.7	9.2	2.5	25.7	85,712
Ohio	75.1	2.7	12.7	6.6	2.0	30.1	73,925
Minnesota	70.2	3.5	18.0	5.3	2.3	24.0	347,111

Notes: Percentage values in the table refer to the percent of exiting CRP land (i.e., land associated with an expiring contract and not reenrolled), including land that was enrolled from the general and continuous signup. The table does not include the "other" and "non-CRP program" land use categories. The sum of percentage values in each table row across land uses (i.e., excluding the percentage of continuous CRP land that exited) may therefore not sum to 100.

Source: USDA, Economic Research Service calculations based on analysis of USDA, Farm Service Agency Common Land Unit (CLU) data, FSA Modernize and Innovate the Delivery of Agricultural Systems (MIDAS) program data, and USDA, National Agricultural Statistics Service Cropland Data Layer.

Practice-Specific Trends in Post-CRP Land Use

The prior section examined the fate of exiting CRP land, broken down by continuous and general signups. In this section, we consider the fate of exiting CRP land broken down by the conservation practices on the land when it was in the CRP. From a conservation standpoint, the pattern of post-CRP land use across different CRP practices has implications for the continued realization of benefits the land was providing while enrolled in the program. For instance, if land enrolled in the CRP for a tree practice remains in tree cover after exiting the program, the specific environmental benefits that provided the rationale for enrolling the land in the program are more likely to, at least partly, endure. If the same parcel were instead converted to grass cover, some of the prior CRP benefits would no longer persist, although the land would likely provide greater environmental benefits (e.g., water filtration, soil erosion control, and soil carbon sequestration) than if it were converted to crop production.

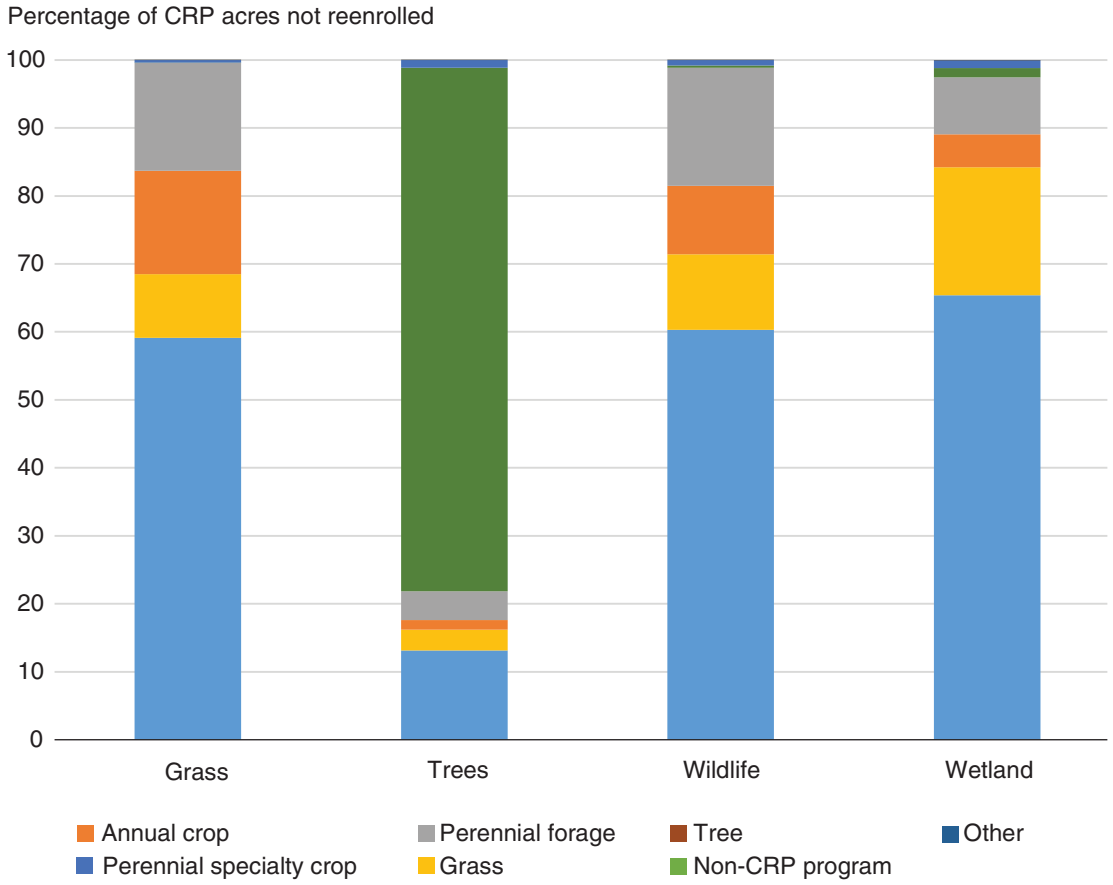
Annual crop production was the dominant post-CRP use for grass, wildlife, and wetland practices, accounting for 59-65 percent of exiting acreage in 2013-2016 (figure 11). Land formerly enrolled in the CRP for a wetland practice had the greatest share of post-CRP annual crop production (65 percent), while former tree-practice land had the lowest annual crop share (13 percent).[18] Wetlands were also more likely than other types to be used for specialty crop production (19 percent of exiting wetland acreage went to specialty crop production). As noted above, wetland benefits may be considered to be less substitutable than those derived from other types of CRP lands, and the higher degree of crop conversion for wetlands may come at a greater environmental cost in terms of foregone benefits. Tree-practice land is far more likely than other types of CRP land to remain in tree cover after the contract expires. About 77 percent of expired CRP land that was in a tree practice had a tree cover after expiration, compared to 1 percent for most other practice types. This implies that the benefits of CRP reenrollment were likely retained, at least in part, on 77 percent of exiting tree-practice acreage, even without the CRP rental payments. It bears mentioning, however, that unenrolled land in tree cover may not provide the same level of ecosystem benefits as it would if it were enrolled in the program—if, for example, the unenrolled land is used to produce forest products after the CRP contract expires. In addition, given the option values associated with the investment in tree practices (they may be harvested a number of years after expiration), post-CRP tree cover may simply represent a transitional cover before the land is eventually converted back to crop production.

Grass-practice land was the most likely of all practice types to transition to perennial forage production (15 percent of exiting acreage). It was also one of the most likely types of CRP land to remain in grass cover (16 percent). CRP land formerly enrolled under a wildlife-focused practice was the most likely to remain in grass cover (17 percent of post-CRP acreage).

[18]Given the presence of partial-field tree practices, we make an exception to the land use assignment rule for tree-practice land that exits the program. Specifically, for exiting tree-practice land only, we assume that the relevant portion of the field (i.e., the part formerly enrolled in the CRP) remained in tree cover if we observe any tree cover on the CLU in every post-contract year. At any point, if the CLU completely transitions to a non-tree cover, the land will not be considered to have remained in tree cover. Without using this tree-practice exception, we end up with roughly 55 percent of tree-practice land converting to annual crops, which, as reviewers pointed out, seems unrealistically high given the costs of clearing trees and planting new crops, especially given the 1-4 year period considered in this report. We acknowledge that the adopted method, which results in 13 percent of tree-practice land converting to annual crop production, may overstate tree retention to some degree, but we feel it provides a more plausible estimate of post-CRP land use on land used for tree practices. In reality, the total amount of tree-practice land converted to annual crop production likely lies between 13 and 55 percent.

Overall, tree-practice land was the least likely to transition to some type of crop production (annual, specialty, or perennial forage crop use) after it exited the CRP (17 percent of exiting acreage), whereas land used for wetland practices was the most likely (89 percent) (figure 11).

Figure 11
Use of land exiting the Conservation Reserve Program (CRP) by practice type, contracts expiring over 2013-16



Source: USDA, Economic Research Service calculations based on analysis of USDA, Farm Service Agency Common Land Unit (CLU) data, FSA Modernize and Innovate the Delivery of Agricultural Systems (MIDAS) program data, and USDA, National Agricultural Statistics Service Cropland Data Layer.

Conclusions and Policy Implications

The fate of land in expiring Conservation Reserve Program (CRP) contracts has implications for both the environmental benefits that accrue from enrolling land in the program and the cost-effectiveness of the program as it is currently administered. Overall, most land (64 percent) associated with CRP contracts expiring over 2013-16 was not reenrolled and exited the program. The effects this lack of reenrollment has on ecosystems depend on the ultimate use to which the expired CRP land is put. Seventy-nine percent of land that exits the program (51 percent of land in expiring contracts) has returned to some sort of crop production (annual, specialty, or perennial forage crop use), with soybeans, corn, and wheat being the most common crops grown on previously enrolled land. The fact that such a large number of expiring acres do return to crop production implies that continual CRP reenrollment may have been important for maintaining the conservation benefits that accrued from the initial retirement of environmentally sensitive cropland.

The post-CRP land use patterns illustrated for 2013-16 differed markedly from those reported in the past (figure 2), with recent years having much higher rates of crop production on lands exiting the program. Part of this pattern is likely explained by the high crop prices that characterized 2013. Another factor is the paucity of general signups over 2013-16, which may have impeded reenrollment of expiring CRP parcels. As a result, some of the post-CRP crop conversions we observe were likely deliberate and would have occurred even with a more expansive program, while others were likely induced by the more restrictive program conditions.

An alternative way to view the results of this analysis is through the lens of additionality, an economic concept that has bearing on the budgetary effectiveness of CRP reenrollment. As it relates to incentive-based conservation programs, environmental benefits are additional if the contracted conservation practices would not have been undertaken without the associated program payments.[19] In the context of this report, the results shed some light on whether or not payments for CRP reenrollment (as opposed to CRP participation in general) are additional. CRP payments can be said to provide benefits that are additional only if the contracted practice (e.g., riparian buffer establishment) would not have been undertaken without the payments. Put differently, if rental payments are not needed to retain land in the conservation cover mandated by the program, then CRP reenrollment does not produce additional benefits. Our results suggest that about 79 percent of land that exits the program returns to crop production. This suggests that CRP rental payments are likely additional, to some degree, and are instrumental to realizing the conservation goals of the CRP. Given that adoption of CRP practices entails a fundamental change in how the land is used, the high rate of potential additionality is expected and reinforces earlier findings in the literature (Claassen et al. 2014).

[19]See Claassen et al. (2014) and Claassen et al. (2018) for analyses of additionality in the context of U.S. agricultural conservation programs. The main findings indicate greater additionality for practices that have higher start-up costs and provide fewer direct benefits to the landowner. For initial enrollment into CRP, and land retirement programs more broadly, direct economic benefits to the landowner are relatively low, suggesting that one would expect a higher degree of additionality than something like payments for no-till adoption under USDA's Environmental Quality Incentives Program. However, the question of whether CRP *reenrollment* provides additional benefits is complicated by the fact that the land has already been out of production for 10-15 years. For studies of additionality as it pertains to other natural resource policies, see Claassen et al. (2017; grassland easements) and Mason and Plantinga (2013; forest carbon offsets).

Looking across different CRP practices, we find that tree practices have yielded the most durable benefits, at least in the short term (1-4 years after contract expiration): over 77 percent of exiting land that was in a tree cover practice remained in tree cover during 2013-2016. Of all CRP practices, tree-cover land is also associated with the highest rate of reenrollment, suggesting large economic costs are associated with removing tree cover on land where it has been established. Across States, we find that the Plains region (including Texas, Kansas, Nebraska, and Oklahoma), where cattle that can utilize grazing land are relatively common, has the highest rates of post-CRP grass cover. Although unmanaged grass likely has lower conservation value than land enrolled in the CRP (for example, it may be grazed with less concern for bird nesting seasons) it still suggests that land retirement benefits may be more persistent, post contract, in these areas. Likewise, for States in the Southeast, where post-CRP tree cover is relatively more common, program benefits are also more likely to endure. States characterized by high-valued commodity crop production in the Midwest are most likely to convert land back to crop production—a move that has implications for water quality and the other types of environmental benefits provided by land enrolled in these States.

Although the results presented here have implications for the design of USDA conservation policy, several caveats should be noted. First, the broader implications derived from this study concerning the persistence of post-contract benefits, and, consequentially, the additionality of CRP program benefits, turn on the comparability of land that exited the program and land that was reenrolled. Our results overstate the overall additionality of benefits achieved through CRP reenrollment if the land that exits the program is more likely to have a higher production value, and hence a higher probability of conversion to crop production. Teasing out the degree of this "self-selection bias" in our results would require a more rigorous econometric/matching sample selection model (as in Claassen et al. 2018), which is beyond the scope of the present analysis and left for future research. The study period in this analysis is likely characterized by a lower degree of self-selection than prior years, given the fact that some land was likely pushed out of the program by the limited nature of general signup opportunities over 2013-16.

Second, the analysis described covers, at most, 4 years of post-CRP land use for each common land unit observation. As a result, concerning the ultimate fate of expiring CRP land, less confidence should be placed on the estimates for contract expirations in more recent years. For example, if land exits the CRP and remains in grass cover for 1 or 2 years before eventually returning to crop production, then at least 3 years of post-CRP data would be needed to track the land's return to crop production. Because of this lag, even the relatively high rates of crop conversion we found may understate the additionality associated with reenrollment if some land not identified as immediately going back to crop production eventually will. This is particularly true for land enrolled for tree practices, where the long timeframe needed to establish tree cover and the high costs associated with removing it may mean landowners need more time to make the decision to clear the land and convert it to crop production.

Last, although it is likely that many of the environmental benefits (e.g., soil carbon sequestration, water filtration, and wildlife habitat provision) are likely lost when land exits the CRP and returns to crop production, there are potentially some offsetting benefits. For one, some have suggested that expiring CRP land provides a prime candidate for land suitable for organic production systems (Delate et al. 2002), since receiving an organic label from the National Organic Program requires that the land be removed from conventional production for at least 3 years. The costs of this transition period are commonly cited as one of the major barriers to organic adoption (Reganold and Wachter, 2016). Since expired CRP land has, by definition, been out of production for 10-15 years,

these transition requirements are easily satisfied. As noted previously, some research has suggested that former CRP land may be more productive and more suitable for soil-friendly tillage practices when it returns to production (Jacobson, 2014). The results of the present analysis are limited because specific production practices are not observed for expired CRP land that transitions back to cropland use; that information would be required for a complete accounting of the environmental impacts of post-CRP land use changes. In addition, USDA's Transition Incentives Program (TIP) provides additional rental payments to the owners of CRP land if they transfer their land (either through a sale or long-term lease) to a beginning farmer or rancher. The beginning operator must agree to implement conservation-friendly practices on the land when it returns to production. Given that access to farmland, particularly cropland, is a common difficulty faced by beginning farmers wishing to achieve a commercially viable scale of production, expiring CRP land may provide one avenue to ease this tension.[20]

[20]Prior to the changes outlined in the Agriculture Improvement Act of 2018, the TIP provisions previously applied only to retiring farmers who owned CRP land. The 2018 Act also increased funding for the program, from $33 million to $50 million, over the next 5 years. For more information on the Transition Incentives Program, see USDA, FSA's website.

References

Claassen, R., E.N. Duquette, and D.J. Smith. 2018. "Additionality in U.S. Agricultural Conservation Programs," *Land Economics* 94 (1):19-35.

Claassen, R., J. Horowitz, E. Duquette, and K. Ueda. 2014. *Additionality in U.S. Agricultural Conservation and Regulatory Offset Programs*, ERR-170, U.S. Department of Agriculture, Economic Research Service.

Claassen, R., J. Savage, C. Loesch, V. Breneman, R. Williams, B. Mulvaney, and T. Fairbanks. 2017. "Additionality in Grassland Easements to Provide Migratory Bird Habitat in the Northern Plains," *Journal of Agricultural and Resource Economics* 42 (3):291-309.

Delate, K., C.A. Cambardella, and D.L. Karlen. 2002. "Transition Strategies for Post-CRP Certified Organic Grain Production," *Crop Management* 1, 9 pgs. (published online).

Hansen, L., D. Hellerstein, M. Ribaudo, J. Williamson, D. Nulph, C. Loesch, and W. Crumpton. 2015. *Targeting Investments to Cost Effectively Restore and Protect Wetland Ecosystems: Some Economic Insights,* ERR-183, U.S. Department of Agriculture, Economic Research Service.

Hellerstein, D. 2017. "The US Conservation Reserve Program: The Evolution of an Enrollment Mechanism," *Land Use Policy* 63:601-610.

Hellerstein, D. and S. Malcolm. 2011. *The Influence of Rising Commodity Prices on the Conservation Reserve Program*, ERR-110, U.S. Department of Agriculture, Economic Research Service.

Hendricks, N.P. and E. Er. 2018. "Changes in Cropland Area in the United States and the Role of CRP," *Food Policy* 75:15-23.

Jacobson, S. 2014. "Temporal Spillovers in Land Conservation," *Journal of Economic Behavior and Organization*, 107:366-379.

Jones, C.A., C.J. Nickerson, and P.W. Heisey. 2013. "New Uses of Old Tools? Greenhouse Gas Mitigation with Agricultural Sector Policies," *Applied Economics Perspectives and Policy,* 35 (3):398-434.

Mason, C.F. and A.J. Plantinga. 2013. "The Additionality Problem with Offsets: Optimal Contracts for Carbon Sequestration in Forests," *Journal of Environmental Economics and Management*, 66:1-14.

Morefield, P.E., S.D. LeDuc, C.M. Clark, and R. Iovanna. 2016. "Grasslands, Wetlands, and Agriculture: The Fate of Land Expiring from the Conservation Reserve Program in the Midwestern United States," *Environmental Research Letters* 11:1-9.

Reganold, J.P. and J.M. Wachter. 2016. "Organic Agriculture in the Twenty-First Century." *Nature Plants* 2:15221.

Roberts, M.J. and R.N. Lubowski. 2007. "Enduring Impacts of Land Retirement Policies: Evidence from the Conservation Reserve Program," *Land Economics* 83 (4):516-538.

Trostle, R., D. Marti, S. Rosen, and P. Westcott. 2011. *Why Have Food Commodity Prices Risen Again?*, WRS-1103, U.S. Department of Agriculture, Economic Research Service.

U.S. Department of Agriculture, Farm Service Agency (USDA, FSA). 2018. "CRP Ending Enrollment by Fiscal Year, 1986-2016." Accessed online.

U.S. Department of Agriculture, Farm Service Agency (USDA, FSA). 2016. "The Conservation Reserve Program: 49th Signup Results." Accessed online.

U.S. Department of Agriculture, Farm Service Agency (USDA, FSA). 2015. "FY 2015 CRP 1-Year Extensions." Obtained via e-mail from Catherine Feather, USDA-FSA.

U.S. Department of Agriculture, Farm Service Agency (USDA, FSA). 2014. "FY 2014 CRP 1-Year Extensions." Obtained via e-mail from Catherine Feather, USDA-FSA.

U.S. Department of Agriculture, Farm Service Agency (USDA, FSA). 2013a. "Conservation Reserve Program Annual Summary, 2013." Accessed online.

U.S. Department of Agriculture, Farm Service Agency (USDA, FSA). 2013b. "The Conservation Reserve Program: 45th Signup Results." Accessed online.

U.S. Department of Agriculture, National Agricultural Statistics Service (USDA, NASS). 2019. "Prices Received: Indexes for Agricultural, Crop, and Livestock Production by Month, US." Data accessed online.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA, NRCS). 2014. *National Resources Inventory: 2012 Annual Data*.

Appendix

Appendix table 1
List of CRP practices, practice-type classification, and signup classification

Practice number	Signup (1=general, 0=continuous)	Practice type	Practice number	Signup (1=general, 0=continuous)	Practice type
CP1	1	grass	CP30	0	wetland
CP10	1	grass	CP31	0	wetland
CP11	1	trees	CP32	1	trees
CP12	1	wildlife	CP33	0	wildlife
CP13	1	grass	CP34	N/A	other
CP13A	1	grass	CP35A	0	trees
CP13B	1	grass	CP35B	0	trees
CP13C	1	grass	CP35C	0	trees
CP13D	1	grass	CP35D	0	trees
CP14	1	trees	CP35E	0	trees
CP15	0	grass	CP35F	0	trees
CP15A	0	grass	CP35G	0	trees
CP15B	0	grass	CP35H	0	trees
CP16	0	trees	CP35I	0	trees
CP16A	0	trees	CP36	0	trees
CP17	0	trees	CP37	0	wetland
CP17A	0	trees	CP38A	0	wetland
CP18	0	grass	CP38C	0	wetland
CP18A	0	grass	CP38D	0	wetland
CP18B	0	grass	CP38E	0	wetland
CP18C	0	grass	CP39	0	wetland
CP19	1	trees	CP3A	1	trees
CP2	1	grass	CP4	1	wildlife
CP20	1	trees	CP40	0	wetland
CP21	0	wetland	CP41	0	wetland
CP22	0	wetland	CP42	0	wildlife
CP23	1	wetland	CP4A	1	wildlife
CP23A	0	wetland	CP4B	1	wildlife
CP24	0	grass	CP4D	1	wildlife
CP25	1	wildlife	CP5	0	trees
CP26	N/A	other	CP5A	0	trees
CP27	0	wetland	CP6	1	grass
CP28	0	wetland	CP7	1	grass
CP29	0	wetland	CP8	0	grass
CP3	1	trees	CP8A	0	grass
			CP9	0	wetland

CRP=Conservation Reserve Program.

Appendix table 2

Transition matrix for expiring CRP lands (2013 to 2016)

Post-expiration land use	Expiring CRP acres that were in land use								
	All CRP			All continuous practices			All general practices		
	Acres	Percent		Acres	Percent		Acres	Percent	
Reenroll into CRP	2,756,818	36		561,167	48		2,195,651	34	
Annual crop	2,773,249	36	57	378,719	32	61	2,394,530	37	56
Perennial forage crop	564,641	7	12	26,068	2	4	538,573	8	13
Perennial specialty crop	522,267	7	11	100,621	9	16	421,646	7	10
Grass	687,206	9	14	68,662	6	11	618,544	10	14
Trees	308,077	4	6	33,506	3	5	274,571	4	6
Non-CRP conservation program	30,407	<1	1	10,409	1	2	19,998	<1	1
Other	1,198	<1	<1	474	<1	<1	723	<1	<1
Totals	7,643,861			1,179,625			6,464,236		

CRP=Conservation Reserve Program.

Notes:

- Around 7.6 million acres, of the 8.1 million acres that expired between 2013 and 2016, could be assigned to a post-expiration land use. The remaining one-half million acres is not accounted for in this table.
- *Reenroll into CRP* combines both general and continuous, with no breakdown by practice.
- **"Percent"** refers to percent as of subset. For example: the 2,756,818 acres of **All CRP** that *Reenroll into CRP* is 36 percent of the total of 7,643,861 expiring CRP acreage. Another example: the 378,719 acres of **continuous practices** that became *annual crop* is 32 percent of the total of 1,179,625 expiring continuous CRP acreage.
- Numbers in the second percent column of each catagory are percents of non-reenrolled land. For example: the 564,641 acres in **All CRP** that became *Perennial forage crop* is 12 percent of the 4,887,044 acres of non-reenrolled CRP acres.

Appendix table 3

Transition matrix for expiring CRP lands (2013 to 2016) – by conservation cover and signup type. Percentages are of column totals.

Post expiration land use	All acres signup: conservation cover before expiration									
	Grass		Trees		Wildlife		Wetland		Other	
	Percent									
Reenroll into CRP	35		47		29		39		44	
Annual crop	38	59	7	13	43	60	40	65	33	59
Perennial forage crop	10	15	1	1	7	10	3	5	8	14
Perennial specialty crop	6	9	2	3	8	11	11	19	5	9
Grass	10	16	2	4	12	17	5	8	9	17
Tree	<1	<0	41	77	<1	<1	1	1	<0	1
Non-CRP conservation program	<1	<0	1	1	1	1	1	1	<0	<0
Other	<1	<0	<1	<0	<0	<0	<1	<0	<0	<0
As percent of total acres	56		9		16		17		1	
	Acres									
Acres in continuous practice	4,304,624		720,050		1,245,747		1,273,248		99,734	

CRP=Conservation Reserve Program.

Notes:

- Around 7.6 million acres, of the 8.1 million acres that expired between 2013 and 2016, could be assigned to a post-expiration land use. The remaining one-half million acres is not accounted for in this table.
- Percentages are percent of total non-reenrolled acres. For example, 13 percent of **Trees (**that did not *reenroll)* went into Annual Crop.
- Numbers in the second percent column of each catagory are percents of non-reenrolled land.

Appendix Table 4a

Transition matrix for expiring CRP lands (2013 to 2016) – by conservation cover and signup type. Percentages are of column totals.

Post expiration land use	General signup: conservation cover before expiration				
	Grass	Trees	Wildlife	Wetland	Other
	Percent				
Reenroll into CRP	35	43	28	28	44
Annual crop	38	6	44	48	33
Perennial forage crop	10	1	8	5	8
Perennial specialty crop	6	1	8	15	5
Grass	10	2	13	4	9
Tree	<1	47	<1	1	<1
Non-CRP conservation program	<1	1	<1	1	<1
Other	<1	<1	<1	<1	<1
	Acres				
Acres in continuous practice	4,194,818	574,570	1,126,574	468,553	99,722

CRP=Conservation Reserve Program

Appendix Table 4b

Transition matrix for expiring CRP lands (2013 to 2016) – by conservation cover and signup type. Percentages are of column totals.

Post expiration land use	Continuous signup: conservation cover before expiration				
	Grass	Trees	Wildlife	Wetland	Other
	Percent				
Reenroll into CRP	46	64	38	46	91
Annual crop	34	10	36	35	9
Perennial forage crop	6	1	3	2	<1
Perennial specialty crop	4	4	11	10	<1
Grass	8	3	9	6	<1
Tree	<1	17	<1	1	<1
Non-CRP conservation program	1	<1	2	1	<1
Other	<1	<1	<1	<1	<1
	Acres				
Acres in continuous practice	109,807	145,936	119,174	804,696	13

CRP=Conservation Reserve Program

Notes:

- The five "**conservation covers**" represent classes of CRP's conservation practices (see appendix 1 for classification details).
- Percentages are percent of total acres before expiration. For example, the 64 percent of **Trees** that became *Reenroll into CRP* refers to *94,098 acres (*64 percent of 145,936 acres that were in **continuous trees***).*